

LEIMIN KOU

ESP: AN EXPERIMENT WITH MIXED AND SPECIFIC  
GROUPS IN READING COMPREHENSION

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## ABSTRACT

This dissertation describes a practical experiment involving three groups of undergraduate students taking English for Specific Purposes at the Federal University of Paraná, in 1984. The experiment was conducted to investigate to what extent the use of specific texts related to students' specialist fields of study might result in a better reading comprehension performance from the students. Thus the main purpose of the study was to discover an acceptable, as well as, an effective procedure to develop reading skills which would enable ESP students to improve their reading of texts in English.

The experimental method consisted of three procedures to the teaching of reading comprehension applied to three different ESP groups. Group A, a mixed group, worked with texts considered of 'general interest', Group B, a mixed group, worked with texts related to each student's subject area of study, and Group C, a specific group, worked with texts solely related to Food Science.

Goodman and Smith's psycholinguistic models of the reading process provided the rationale for the design of the reading course especially devised for this research.

A pre-test and a post-test were applied to measure

the initial and final reading comprehension performance of the students. The statistical analysis of the results led to the conclusion that homogeneous groups as far as academic year, subject area of study and interest are concerned, perform at a more satisfactory level than heterogeneous groups, especially if specific texts related to the students' field of study are used. Although the results do not provide clear-cut conclusions about the heterogeneous groups they lead to several useful pedagogic implications for the teaching/learning of reading comprehension.



## RESUMO

Esta dissertação descreve um experimento prático do qual participaram três grupos de alunos universitários matriculados na disciplina de Língua Inglesa Instrumental da Universidade Federal do Paraná em 1984. O experimento foi elaborado a fim de investigar até que ponto o uso de textos específicos relacionados às áreas de estudo dos alunos poderia resultar num melhor desempenho dos mesmos na compreensão de leitura. Assim, o principal objetivo do estudo foi o de descobrir um procedimento satisfatório e eficaz para desenvolver a habilidade de leitura que possibilitaria aos alunos um aperfeiçoamento na compreensão de leitura.

O método experimental constituiu-se de três tipos de procedimentos ao ensino da compreensão de leitura aplicados a três grupos de alunos. O Grupo A (grupo misto) trabalhou com textos considerados de 'interesse geral', o Grupo B (grupo misto) trabalhou com textos relacionados à área de estudo de cada aluno, enquanto o Grupo C (grupo específico) trabalhou com textos relacionados à área de Nutrição.

Os modelos psicolingüísticos do processo de leitura de Goodman e Smith foram usados como base teórica para o planejamento do curso de leitura especialmente elaborado para esta pesquisa.

Um pré-teste e um pós-teste foram aplicados para medir o desempenho inicial e final dos alunos na compreensão de leitura. Os resultados da análise estatística demonstraram que grupos homogêneos, levando-se em consideração o ano acadêmico, a área de estudo e interesse dos alunos, desempenham melhor do que grupos heterogêneos, especialmente quando trabalham com textos específicos relacionados a suas áreas de estudo. Embora os resultados obtidos não nos ofereçam conclusões mais definidas sobre os grupos heterogêneos, eles nos fornecem diversas implicações pedagógicas úteis ao ensino e aprendizagem da compreensão de leitura.

## INTRODUCTION

In recent years there has been an increasing demand for reading courses in Brazil, as well as in other countries, especially within the ESP (English for Specific Purposes) context. Students, particularly at university level, need to be able to read in the language in order to gain access to the vast world of English printed matter in both academic and commercial fields.

The specific purposes for which learners need English has led teachers and course designers to devote much more attention to the learner than to other factors related to the teaching/learning situation.

The following quotation from BROUGHTON<sup>3</sup> reflects the expectancy of most students who need to learn English as a professional tool:

The very nature of the ESP learner, who has a specific goal that he wants to reach as quickly and economically as possible, makes it unlikely that any course prepared for a global market will be entirely satisfactory [...] it also means that he wants quick results and that he will only accept an approach that is immediately relevant to his needs. He will not be prepared to devote more time to learning English than is absolutely necessary.

From what follows, one of the most important and crucial components of an ESP reading course, is the teaching material, particularly the selection of texts to be used during the course.

Experience with previous ESP groups has shown that the prime interest of ESP undergraduate students tends to be in matters related to their specialization. In practice, a number of problems arise, including: large and heterogeneous classes, students from different areas of study in the same group, time and energy for the preparation of specific materials and the lack of teachers for specific groups of students.

The divergence of opinion among ESP teachers in relation to whether s/he should use texts selected from the students' subject area of study or texts considered of 'general interest' selected from a wider variety of sources was the starting point of this project.

An experiment with three groups of undergraduate students was carried out to test the hypothesis that the use of 'general interest' texts would result in a better and faster reading comprehension performance among ESP students than two possible alternative procedures in which specific texts selected from the students' subject area of study are used.

The ESP courses considered here consisted of 60 hours learning/teaching contact hours involving four classroom hours per week. They were designed and planned by the author of this dissertation and taught to mixed and specific

study area groups of undergraduate students of the Federal University of Paraná in 1984.

Before this experiment was carried out, two similar courses were designed and taught in 1983 as a pilot research. Their objective was to test materials and procedures in a similar experiment which would then be applied to the present experiment.

This dissertation was divided into five parts. Chapter 1 is concerned with describing the processes employed by the fluent reader while actively engaged in reading comprehension in his mother tongue. The psycholinguistic reading models of Smith and Goodman were used as a basis for our theoretical framework and methodology.

Chapter 2 is an attempt to shed light on some of the fundamental aspects of ESP in general. Clarification of certain concepts are given which are felt to be important for this work. Chapter 3 is concerned with the design of ESP courses in our experiment. Several principles presented in the previous chapter were taken up for the design of the courses in question. The last two chapters deal with the data analysis of the results obtained from the three experimental groups and the conclusions.

It is hoped that this research may offer guidelines toward the preparation and selection of reading materials for an approach which attempts to develop reading skills in a foreign language for specific purposes.

## CHAPTER 1

### READING COMPREHENSION

#### 1.1 READING

The reading skill was traditionally argued as that related to the language expressed through the visual medium and to the activity of the language user, that is, it is said to be a passive skill<sup>48</sup>(p.57). However, if we examine the abilities that are involved in reading with comprehension of meaning it is clear that readers are far from passive during this activity; it is, more correctly, a receptive skill<sup>48</sup>.

There are, in addition, two aspects which should be taken into consideration when referring to 'reading':

One of them is the 'learning to read' aspect in which the language user is taught how to decode the graphic symbols of the language. Following this line, many different approaches have been advocated and used in the teaching of 'learning to read' (DOBSON<sup>7</sup>, KREIDLER<sup>25</sup>, FINOCCHIARO and BONOMO<sup>9</sup> among others). They have focused on one or all of the following criteria:

a) **alphabetic**, whereby the learner is taught the names of the letters and then is trained to pronounce the words;

b) **phonemic**, whereby the learner is taught to associate the sounds (phonemes) with letters or groups of letters. The learner then 'sounds out' the sequence of letters;

c) **holistic**, whereby a few words are introduced at a time at the level of meaning, often based on pictures or photographs, each quite different in form and value, then this small repertory of words is repeated in as many different arrangements as possible;

d) **whole sentences**, whereby the learner learns to read sentences rather than individual sounds. This approach is often based on the interest of the individual learner who, having expressed him/herself orally, are then presented with the written form;

e) **syntactic**, whereby the learner is taught the constituents of a sentence and its relation, often in a vacuum of grammatical description;

f) **the audio and oral-lingual method**, whereby the learners are given intensive oral preparation and then taught to correlate the sound patterns with visual referents.

The other aspect is the stage at which the reader reads for understanding and actually derives meaning and comprehension from the printed matter. The truth is that

reading is not simply identifying sounds, words, sentences, nor is it the transference of written language to oral, for which it is conventionally held as a 'decoding process'. In fact, reading should not be regarded primarily as a visual process, there should be a reciprocal relationship between what SMITH<sup>45</sup> (p.12) refers to as **visual information** and **non-visual information**, in reading. The visual information is the printed material in front of the reader's eyes, that is, the letters, words, sentences and groups of sentences. The non-visual information is the stored knowledge which is in the reader's head or behind his eyes; it is what he already knows about reading, about language and about the world in general.

There are at least two main reasons why visual information is insufficient for successful reading. Firstly, the printed matter could be written in another language and, in this case, unless the reader understood the foreign language, he would not be able to read it. Secondly, the reader could be presented with material in his own language but he may not have learnt **how** to read it. Thus it is necessary for the reader to contribute with non-visual information.

The relationship between visual and non-visual information leads to the following: the more information you have of one when you read, the less you need of the other. In other words, it is easier to read a book, for example, when you know about its subject matter in advance.



There is a limit to the amount of information coming through the eye that the visual system can process. The reader who relies primarily on visual information will simply overload his visual system, as well as, his memory system; he will be unable to get as much information as he needs. The reader who concentrates on identifying every word will be unable to read for meaning at a level beyond that of the word.

## 1.2 THE READING PROCESS

The view that reading is not a simple mechanical skill is shared by GIBSON <sup>12</sup> (p.5), among others. He defines reading "as an active process, self-directed by the reader in many ways and for many purposes". Thus, the role of the reader is not that of a passive receiver of meaning in print; he must make an active contribution if he is to acquire the available information from the reading material. Sometimes he has to go beyond his knowledge of the language to reconstruct "as best he can, a message which has been encoded by a writer as a graphic display" <sup>13</sup> (p.22).

In what follows we shall make a closer study of the active role of the reader.

Essentially the main objective of reading is comprehension. SMITH <sup>42</sup> distinguishes two processes of reading comprehension: through mediated comprehension and through

immediate comprehension. In mediated comprehension the reader encounters a word, for example, that he has not seen before, however, he does not go directly from the visual features of that word to meaning. The identification of the word is 'mediated' in a relatively slow process; the reader identifies each letter taking up substantial processing time and space because a great deal of visual information is required to identify it. Consequently, when all the individual words of a sentence are identified the reader is still a long way from having the meaning of that sentence. This rather slow process, i.e., reading for meaning, is a feasible method but not the best method because it is indirect. Although mediated word identification may be used by any reader (whether fluent or beginner) when he has to and when he finds the passage difficult, immediate word identification is preferred to mediated word identification because it is a process by which the reader reads at a rate which will enable him to read for comprehension. As SMITH<sup>42</sup> (p.208) points out "unrelated words cannot be read at the same rate as meaningful text, and it is very difficult indeed to extract meaning from words that are read slowly".

The term 'immediate' does not imply that identification is instantaneous, but that it is direct and fast. Immediate comprehension is usually accomplished by the more fluent reader who goes directly from the visual features to meaning. To accomplish this the reader will depend on factors which will include his prior knowledge of

the language. His experience in reading permits him to take advantage of the redundant features of language; the ways words and letters occur together in the language, for example, if the first letter of a word is t, the next letter will almost certainly be h, r, w or a vowel. This type of prior knowledge, which reduces the alternative number of possibility which a letter or word can be, is termed **redundancy**<sup>42</sup>(p.7).

Redundancy facilitates immediate word and meaning identification because it makes far less visual information necessary. More meaning can be extracted and greater competence can be gained if the reader is able to make use of orthographic, syntactic and semantic redundancy in a piece of text. The reader reconstructs the whole although he extracts only part of the graphic material.

Redundancy may occur at a number of levels:

a) **featural redundancy in individual letters** (the identification of a letter on less than the full amount of visual information that is available);

b) **structure of words** (letters or patterns of features tend to occur only in certain combinations);

c) **across sequences of words** (for various syntactic and semantic reasons, many combinations of visual features are not possible in the language)<sup>42</sup> (p.219).

GOODMAN<sup>13</sup> also views reading as an active and selective process, where the efficient reader is constantly

predicting, sampling and testing his hypotheses. While doing this the reader may utilize three cue systems:

a) The **graphophonic** cue system corresponds to what Smith has called the visual information or the surface structure of the language, that is, the graphic sequences of the language. Goodman expands the concept to include, in addition to this cue, the correspondence between the graphic and the phonological system;

b) The **semantic** cue system corresponds to what Smith has called the non-visual information or the deep structure, which is not simply the question of word-meaning but that which the reader brings to the text to derive meaning;

c) The **syntactic** cue system is the knowledge of the language which the reader must have for full comprehension. The transformation of the visual representation of language into meaning is effected through syntax. Its role is to 'mediate' between visual (or acoustic) surface structure and meaning. SMITH<sup>42</sup> (p.210) refers to syntax as the 'bridge' between the graphic and the semantic cues.

The reading process starts with the graphic cue system and ends with meaning as output. The skilled reader utilizes strategies which enable him to reach his goal as rapidly and efficiently as possible. He performs this by using intelligently the three cue systems simultaneously and independently. While doing this the fluent reader is "sampling, relying on the redundancy of language, and his knowledge of linguistic constraints. He predicts

structures, tests them against the semantic context which he builds up from the situation and the ongoing discourse, and then confirms or disconfirms as he processes further language" <sup>13</sup> (p.23).

Selectiveness is an important factor in fluent reading. The efficient reader uses the minimal effort necessary not only with letters and single words but with phrases, clauses and sentences. Depending on his purposes the reader is also selective in his choice of relevant and non-relevant information. Thus the more proficient a reader is, the greater his possibilities of integrating his background and experience with that of the author. According to SMITH <sup>14</sup> (p.387), "reading is not a matter of decoding from letters to sound but consists of bringing meaning to print".

From what we have described of the reading process, we may conclude that reading is a complex activity which involves many aspects of language, cognition, life and learning. Therefore we have excluded from our theoretical framework the study of schematic and global strategies because each one would require deeper research and study. For this work only the linguistic strategies are mentioned.

### **1.3 IMPLICATIONS FOR THE TEACHING OF ENGLISH AS A FOREIGN LANGUAGE (EFL)**

Although Smith and Goodman describe the reading process of a fluent reader in a first or native language, (L<sub>1</sub>), their psycholinguistic models have several pedagogical

implications for EFL and ESL teaching. When the EFL or the ESL learner comes to read in the foreign language he has already acquired certain reading habits when learning to read in his native language. Besides this, the learner is able to rely on his prior knowledge of the world to process, as best as he can, the information that is available in the printed sample. For the foreign language learner, reading is an active process in which he applies visual and non-visual information, making use of those linguistic cues which he thinks necessary for a general or detailed comprehension, depending on his purpose for reading. Thus he is selective, taking advantage of his knowledge of one factor (e.g. background knowledge) to overcome his lack of control over another factor (e.g. syntactic information).

Along with his psychological model of the ESL reader, COADY <sup>4</sup> (p.11) makes certain considerations on the model's pedagogical implications for ESL teaching. They are the following:

a) the teacher should put primary emphasis on reading instructions and comprehension strategies. Students should be trained not to spend too much time on phoneme-grapheme correspondences\* and word meaning but rather on the ability to make use of syntax and semantics\*\*;

\*According to Coady, phoneme-grapheme correspondences are concrete process strategies.

\*\*Coady refers to syntax and semantics as abstract process strategies.

b) the ESL student should learn to utilize whatever cue systems render useful information and to put them together in a creative manner, always achieving at least some comprehension. Thus a weakness in one cue (e.g. background knowledge of a particular subject matter) can be overcome by a strength in another (e.g. syntactic control over the language);

c) because readers will have differing strengths in the various cue systems, they should be encouraged to utilize them in varying combinations. Thus a reading approach should make use of different types of materials;

d) individualized materials are very useful in reading instruction because they allow the student to proceed at his or her own rate. There is frequent testing for comprehension, i.e., immediate feedback. The teacher is also available for helping individual students with their own particular problems;

e) initial emphasis on increasing the reading speed is necessary to avoid loss of comprehension of the passage as a whole;

f) the subject of reading materials should be of high interest and relate to the background of the individual reader;

g) the teacher's main function in reading instruction should be to get the student moving in the right direction. The student should learn by doing: his goal can be achieved only by practice, i.e., reading.

Having presented very briefly a limited number of attempts to explain and define the processes involved in reading, we will now move on to describe the relatively recent emphasis on 'English for Specific Purposes', within language teaching, one of the many stimuli for renewed interest in the process of reading.

In the next chapter we shall see how the objectives in ESP might be arguably said to fit into the frameworks presented above, and how the reading models will be taken up as a rationale for the type of ESP courses designed within our experiment.



## CHAPTER 2

### ENGLISH FOR SPECIFIC PURPOSES - CLARIFICATION OF CONCEPTS

#### 2.1 ESP - DEFINITION AND TYPES

'ESP' stands for English for Specific Purposes which is a term derived from Languages for Special Purposes (LSP)<sup>36</sup> (p.5), that is, languages taught with a specific utilitarian aim in mind. The 'S' in 'ESP' focuses attention on the 'specific' purpose of the learner for learning the language and not on the language he is learning, not on any 'special' language or 'restricted repertoire' according to MACKAY and MOUNTFORD<sup>27</sup> (p.5). This is why 'S' stands for 'specific' rather than for 'special' as originally understood. The 'P' in 'ESP' refers to the purposes or the eventual practical uses to which the language will be put<sup>50</sup> (p.6) or to the ends one seeks to achieve<sup>24</sup> (p.11). Those who teach English for Specific Purposes have to be clear about what the purposes are, and have to consider the ways to reach those ends.

It can be argued that ESP is neither a new term nor a new method in ELT, but as BRUMFIT<sup>36</sup> (p.10) suggests, "it is a new emphasis in teaching". This new emphasis is more concerned with the learner, his situation, his setting and background, rather than on the teacher or the educational authorities.

Thus ESP focuses on the learner and the purpose for which he requires the target language. Two major categories of ESP derive from these purposes which are either occupational or educational: a) EOP (English for Occupational Purposes) aiming at students who need English to perform part or all of their occupational duties, e.g. working in civil aviation, tourist hotel management, working as waiters, secretaries, telephone operators, police officers, etc. It is activity oriented. b) EAP (English for Academic Purposes) aiming at students who need English for educational purposes, to pursue part or all their studies, the major subcategory of which is discipline-based study, e.g. in agricultural science, chemical engineering, physics, economics, and so on. This latter category can be called curriculum oriented.

MACKAY and MOUNTFORD <sup>27</sup> suggest that EST (English for Science and Technology) is a major subdivision of ESP. In fact, SALAGER <sup>37</sup>, MEAD <sup>28</sup>, and SMITH <sup>41</sup> among others, were involved in studies to analyse the register and rhetorical features of English for science and technology. The results showed, in some areas, marked characteristics of their own in lexis and syntax.

## 2.2 ESP: CHARACTERISTICS

Several characteristics are associated with ESP:

a) The demand for ESP courses are usually more at university level rather than at secondary school level;

b) The curriculum development is relatively short-term with only a very few hours a week allotted to English;

c) The ESP student is a false beginner, an adult or near adult who has completed "a general English course at school or where the school course has been inadequate and now as a young adult wishes to extend or adjust this competence to his or her particular field of work or study"<sup>36</sup> (p.10);

d) Students taking ESP courses do not often, or of necessity constitute a homogeneous group in terms of background, needs, interests, or proficiency in English;

e) The ESP learner's specific goal which he wants to reach as quickly as possible should make the ESP course focus on the students' immediate academic needs.

### 2.3 NEEDS AND PURPOSES

In a learner-centred approach such as ESP it would seem logical that attention to the needs and purposes of the learner would be key elements in the design of an ESP course. However, before considering the aspect of what has come to be termed 'needs analysis', now almost a household word, it is worth examining ALDERSON's<sup>1</sup> (p.135) distinction that can be made amongst different types of needs: one can distinguish **formal requirements** (the 'need' to pass an exam) from **actual needs or obligations** (what the students actually

have to do with the language) and from **hypothetical future needs** (the 'need' to inform oneself and become a better professional in the future by reading in a foreign language), and one can also distinguish demands made by the institution (the 'need' for actual behaviour, for example, reading that one is expected but not required to) from those perceived and felt by the students themselves (the 'need' the student feels to read English, as distinct from what is required or expected) and his or her desires (the 'need' to learn to speak English in order to interact socially), or just to learn the language for pleasure, although the want or need may only be for reading.

It is the responsibility of the teacher or the course designer to detect what the learner's needs are. This is commonly carried out through the use of questionnaires or interviews.

Various models exist for needs analysis, among which the best known are those of RICHTERICH and CHANCEREL<sup>34</sup> and of MUNBY<sup>30</sup>.

The most extensive theoretical study of the learner's needs is that of Munby. He proposes a model for specifying the communicative competence of a student. This operates in two stages, firstly by building up a profile of student needs and secondly by converting these needs into syllabus content.

In order to construct a profile of the communicative needs of a particular participant (P) the model seeks information according to two sets of parameters. The first

set concerns the type of ESP required and the particular educational or occupational purpose in question; the physical and psychosocial setting in which the language will be used; the social relationship in which the participant will be involved; and the medium, mode and channel of communication required. The second set of parameters concern linguistic data relating to dialect, target level required; the communicative event, i.e. what the participant has to do, either productively or receptively, which will involve consideration of topics and skills; and the communicative key, i.e. how the participant performs, which will involve consideration of attitudinal devices.

Having built up a profile of students needs, Munby interprets the needs in terms of language skills and linguistic encoding which will derive the 'communicative competence specification' for the student or group of students in question.

Munby's model has been criticized by numerous specialists in the field in terms of its high degree of rigid specification, its seeking to catalogue, classify and predict all possible inputs and outcomes. According to COFFEY<sup>5</sup> (p.7) "it is a once-and-for-all process that apparently needs not be amended as time goes on".

Richterich and Chancerel's work suggests that the identification of a learner's needs should be undertaken by three separate bodies: a) by the learner himself, before and during the course; b) by the teaching establishment, before and during the course; c) by the user-institution

(i.e. the learner's employer) before the course. The information of needs consists of collecting, processing and using a certain amount of information to construct, with the learner, a learning project.

For Richterich and Chancerel 'needs analysis' is an ongoing process and should not be confined to the beginning of a course. They recognize that a learner's needs may change even while he is taking a language course, due to various factors.

The fact is that there are indications (DROBNIC<sup>8</sup> and POTTER<sup>33</sup>, for example) that any needs analysis is liable to drawbacks, from which POTTER<sup>33</sup> (p.39) concludes that "needs analysis is not just an analysis of the target language performance of the learners, it is an attempt to bring together all those factors that are external and internal to the learning process". For WIDDOWSON<sup>50</sup> (p.22) "needs cannot be fixed in advance but must be a matter of negotiation as part of the actual educational process".

In the light of all this, alternatives are proposed which neither abandon nor ignore needs analysis but rather find solutions to remove anomalies. HOLLIDAY and COOKE<sup>17</sup> for example, advocate a 'Means Analysis' to complement the needs analysis in syllabus specification. In the Means Analysis some aspects of Classroom Culture (lack of awareness of real needs and purposes on the part of the teachers, students numbers averaging 100, sparsely equipped lecture theatres, uncondutive to communicative activities, etc.) and Management and Infrastructure (hold-ups in the

bureaucracy, high degree of centralization, system inflexibility when faced with innovative new institution, lack of funds), which may seem negative, and appear to be constraints, are not treated as such. Holliday and Cooke consider these factors as 'local features' which may prove to have positive and exploitable aspects. They are taken into account from the very start in order to ensure a course that is acceptable.

Needs identification instruments should provide the teacher and the materials' writer with directions to follow. These may be derived from information concerning factors which are related to the learner. Thus the more information that is available the more detailed the needs analysis can be. However, one must not forget that factors may cause needs to change even during a course. It is therefore necessary that any eventual course design should be flexible.

## **2.4 COURSE DESIGN**

Aided by the analysis of the information obtained in the first phase, the teacher or planner should translate the data into linguistic and pedagogic terms in order to produce and teach the course.

Any course may differ from one to another in its selection of skills, topics, situations, functions and also language. In ESP, the course designer should concentrate

exclusively on those elements which are essential to the learners' specific needs and aims. Thus the content of the course will include only those items which are felt to be required according to the analysis of the purposes of the learners; it should be restricted to the necessary basic skills (understanding speech, speaking, reading or writing) and it should include only those items of vocabulary, patterns of grammar, functions of language, themes and topics which are essential to success in a specific purpose.

#### 2.4.1 Skills

An ESP programme may not differ from the normal four skill approach used in general language programmes. However, there are 'specific' situations in which only one or two skills are emphasized. This will depend on the learning goal of the student. If the learning goal is confined to enabling the student to learn to read in English then the emphasis will be given to reading comprehension. If it involves understanding lectures in English then emphasis is placed on listening comprehension.

Besides the four primary skills of reading, writing, speaking and listening, it is important to consider other study skills. These skills may be linguistic or non-linguistic<sup>24</sup>. The linguistic skills for reading would include the ability to deduce the meaning and use of unfamiliar lexical items, understanding information in the text, using indicators in discourse, note-taking, scanning,



skimming, etc. The non-linguistic skills would include the ability to use libraries, the ability to use a dictionary, naming and requesting tools and materials, etc.

#### 2.4.2 Vocabulary and Grammar

Before a course can be designed, a selection of items and features from the corpus of the language that are relevant to the designer's intention and the students' needs should be carried out.

The teaching of ESP does not imply the teaching of a special type of language. The type of English which will be necessary to the student will not be the result of any special register analysis of a given speciality (Architecture, Economics, Law and so on). Early works in ESP regarded register analysis as the guiding principle to any course design. The fact is that methods of producing materials based on register analysis are still under debate. Analysis of register and rhetorical features are leading to important results which will certainly be taken up in the design of any ESP course.

It may well be that scientific English contains, for example, a similar range of structures as any other register of English; the difference lies in the frequency of use<sup>23</sup> (p.19). There may be a tendency for more passives, more complex nominal groups or verbs in the present simple while there may be few occurrences of question-tag forms, for example.

It would appear that scientific language seeks to define, classify, generalize, draw conclusions or hypothesize. Thus a sentence composed of two main clauses may be performing an act of defining. What course designers should concentrate on, however, is which function the structure has in the text from which it is taken. Then the learner must be taught how to recognize the linguistic surface features which express these functions, whether they are classifying, generalizing or drawing conclusions, and how these individual functions are linked together in a text to form larger units.

#### **2.4.3 Discourse Analysis**

Encouraging learners to move beyond word-level and sentence-level into the processing of texts has been increasingly emphasized as important in recent years, together with an awareness of the crucial factor of making learners conscious of devices of cohesion and coherence which build language into discourse. Thus text analysis has received considerable attention in recent years particularly in relation to its application to ESP.

Text analysis has been applied in several ways, both as a means of analysing a spoken or written text in a hierarchy of constituent units, as a means of identifying the way in which transition within a text is effected by means of discourse markers and connectives, as well as a means of analysing a text into its rhetorical features, such

as description, classification, definition, comparison, etc., together with an awareness of how these functions are related in language and how they are sequenced<sup>5</sup> (p.5).

#### **2.4.4 Materials**

In ESP the topics and themes to be taught are normally selected according to the interests and requirements of the learner. Ideally, materials should be individualized. However, there are no ready-made materials that will suit all and every student. Thus, it is up to the teacher to provide materials which may come close to meeting the widest number of common learning needs in the whole group.

There seems to be certain divergences of opinion over two important issues concerning materials production in ESP: whether the materials writer should use authentic texts or should create his own simple texts or even use simplified texts, on the one hand, or, whether texts should be related to the students' specific area of study or of general interest selected from a variety of sources.

##### **2.4.4.1 authentic materials**

These dichotomies lead naturally into the discussion regarding 'authentic' text materials. Authenticity is in essence a simulation of a real-life task. Thus the gathering of such authentic data is in accordance with the

orientation towards purpose. The learners are studying because they have actual or simulated purposes related to the real world.

The compilation of data may range from the selection of textual input from the students' proposed course of study to collecting samples of recorded speech from airline personnel, visits to factories or the use of actual hospital equipment for nursing training.

According to MORROW <sup>29</sup> (p.13) authentic means 'real' and an authentic text "is a stretch of real language, produced by a real speaker or writer for a real audience and designed to convey a real message of some sort". In other words, it is produced with a specific readership in mind. An 'authentic' text is, therefore, any written or recorded sequence which is unadulterated or completely original. However, FORTUNE <sup>10</sup> (p.45) mentions 'semi-authentic' materials in which 'lecturettes' are recorded and where the lecturers are asked to give a short lecture from their notes in as near as their normal style as possible.

Authentic materials or texts have the following advantages: the original purpose of the materials is maintained through the fidelity to the subject matter; they give the students a taste of 'real' language in use; they also use the language features of genuine technical manuals and textbooks enabling students to develop their ability to read the prose written initially for native speakers especially that containing technical subject matter<sup>46</sup> (p.74).

According to GRELLET<sup>14</sup> (p.8), authenticity also means that nothing of the original text is changed and also that its presentation and layout are retained. The material should be presented as it first appeared in the paper, magazine, textbook or journal; with the same typeface, the same space devoted to the headlines, the same accompanying picture. This contributes to conveying the message to the reader and the exploitation of the authentic graphics-illustrations, diagrams, charts, flow-charts, organograms, maps and other information conveyed in graphic or tabular form.

The definition by Morrow and the advantages presented above are relevant to ESP when considering the production of materials. However, this tendency towards authenticity may have its dangers. As Morrow's definition implies, such language is always particular and individual; it involves a particular writer or speaker writing or speaking to a particular audience in a particular environment or circumstances. This audience, in our case, the learner, may not, at that particular time, respond to that particular authentic material. Thus, authenticity has to do with appropriate response.

MORROW<sup>29</sup> (p.15) suggests that every text has a 'topic, function, channel and audience' and a text is 'authentic' for students only if it is appropriate for them in terms of all four elements. Too often texts are selected on the grounds of topic only, so that while being authentic they are not relevant, at least in terms of these four elements.

WIDDOWSON <sup>48</sup> (p.80) adopts the term 'genuine' language instead of 'authentic' language. Thus 'genuineness' is a characteristic of the passage itself and is an absolute quality.

#### 2.4.4.2 simple and simplified materials

Simple and simplified materials are aimed at ease of communication; they have been deliberately simplified in order to make communication possible with certain interlocutors.

Simplification is most often applied to reading materials. Thus simplified versions are passages in which the teacher or the materials writer has adjusted the language presented to the learner for the sake of language teaching. These versions may be derived from genuine instances of discourse but go through a process of lexical and syntactic substitution. A simple account, on the other hand, according to WIDDOWSON <sup>48</sup> (p.89), "represents not an alternative textualization of a given discourse but a different discourse altogether".

Widdowson makes clear that simple accounts are to be preferred to simplified versions because a simple account is a genuine instance of discourse.

Both simple and simplified versions have been criticized by course designers. They argue that: these materials are 'unnatural' and contrived, different from real or authentic texts; they tend to lack the discourse

features of genuine texts; they tend to exercise a control over syntax and lexis; they are fundamentally non-communicative since they are written essentially to present language data rather than to convey information; simplified versions from original sources often lose certain crucial aspects at the semantic level in the simplification process; the material provided cannot be exploited in the same way in which a specialist would use authentic materials; if the conceptual knowledge of the learner is higher than his linguistic level, then using simplified materials (which also simplify subject content) may cause offense to the learner<sup>23</sup> (p.48); and students trained exclusively or at length on standard classroom reading materials often find themselves unable to cope with 'untreated' textbook or other non-adapted materials<sup>46</sup> (p.77-8).

It has become clear that in the teaching of ESP that it is insufficient to develop materials which aim to introduce the students only to the linguistic features of the language. One is probably better advised to present them with materials which are designed to help them perform the skills which they may well be required to exercise in their work or study.

#### **2.4.4.3 subject matter**

As far as content is concerned there are two branches of ESP courses:

a) **Specific subject matter**, where the emphasis is on the 'specific purpose', that is, on the subject specific matters derived from the students' proposed course of study: texts in mechanical engineering for mechanical engineer. When the students themselves tend to be interested in matters related to their speciality.

HUTCHINSON and WATERS <sup>19</sup> (p.56) draw important conclusions from the use of input materials taken unadulterated from the technical course. These materials present difficulties over content for the following reasons. In the first place, a text does not exist in a vacuum but has a position within a body of knowledge: the text will form part of a lesson or series of lessons. In the 'authentic' situation much of the work of understanding the new text will be achieved by reference to other parts of the publication. Coming to it 'cold' in the EFL classroom, the student is denied these contextual clues. Comprehension is, therefore, more difficult. Secondly, if language use in the classroom is to simulate real communication there must be discussion of the subject matter, and this will inevitably stray beyond the actual text being studied. Yet the EFL teacher often does not know enough about the subject matter to be able to handle this sort of situation. Thirdly, what EST students need is not so much specialist terms but the competence to enable them to decode the specialist terms that they may encounter. "Technical English is not generated from nowhere, it is a development from the general stock of the language" <sup>21</sup>.



b) **General interest matter**, where content is not so specific as in the first case, but related to other areas of technical knowledge as there is a great deal of common ground between various technical fields. The following are rich sources of reference: the basic function of a car; the application of technology in the home (electricity, refrigerators); technology in society (energy, resources, transport); simple science (human biology, heat); basic geography (earthquakes, the plants) and mathematics<sup>19</sup> (p.66).

In a similar way, WIDDOWSON<sup>48</sup> (p.15-6) suggests that the area of use which would appear to be most suitable for the selection of reading topics for the secondary level learner would be those of the other subjects on the school curriculum, subjects like history, geography, general science, art and so on. The kind of language course that he envisages is one which deals with a selection of topics taken from other subjects: simple experiments in physics and chemistry, biological processes in plants and animals, map-drawing, descriptions of basic geological features, descriptions of historical events and so on.

RISTOFF<sup>35</sup> (p.10) points to the fact that academic students are faced not only with books, but also, and sometimes, mainly, with magazines. Thus we should look for texts less often in encyclopaedias and books, and more in magazines, newspaper sections and bulletins.

The implications of using these types of input materials are twofold, according to HUTCHINSON and WATERS<sup>19</sup>.

On the one hand, references to other areas of knowledge are an important aid to comprehension. Things already familiar to the student can be used to exemplify a new idea. On the other hand, the association of ideas makes new information easier to retain, since the human memory operates by the association of one idea with another.

## **2.5 METHODOLOGY**

The teaching of ESP does not necessarily have to rely for its success on any new or sophisticated method. In fact, the same methods applied to general ELT teaching might well be appropriate to ESP, as, for example, pair and group work, language learning strategies, etc. What is new in ESP is the emphasis given in teaching. Thus, new approaches are being tried out which focus on the learner and his needs. The aim of any course will clearly determine the teaching methodology. Depending on the nature of the learner, and the nature of the learning goal, one method is going to be more appropriate than another. ESP, whether for occupational purposes (EOP) or for academic purposes (EAP) requires a teaching methodology which will guide learners towards an ability to handle language in use.

### **2.5.1 The Use of Authentic Materials**

One feature of an ESP methodology derives from the use of authentic materials. Thus we find courses involved

in devising a methodology for the adequate combination of authentic materials to teaching.

ALDERSON<sup>1</sup> (p.138) proposes a process approach which focuses on techniques and strategies which will help students to deal independently with any text in their subject area by providing them with possible approaches to a text.

A process approach is different from a product approach in that the students are not taught how to comprehend a text, rather they are shown a text and then tested on it to show if they have understood its content. Sometimes 'language work' is also included. In the process approach exercises are presented first, aimed at helping comprehension not only of one particular text, but of any other text. Another important difference between the two approaches is the different ways of teaching vocabulary. In the product approach the teacher teaches the meaning of individual words or simply tests their understanding; the process approach attempts to give the students strategies for dealing with unknown words in the text.

Likewise, in JOHNS and DAVIES's 'TAVI' (text as a vehicle for information) approach, the objective is to provide students with the experience of dealing with the full range of authentic texts they are likely to encounter in their studies. With this method activities are undertaken before the text is presented, information supply something like the 'situational context' for the learner, thus awakening interest and establishing the purpose for

which the text is to be studied.

PHILLIPS and SHETTLESWORTH<sup>32</sup> (p.25) offer two modes of utilization of authentic materials. Firstly, they can be graded in terms of accessibility, taking into account the absolute length of the passage, the density of new information and the process of supportive graphic features. Secondly, it is possible to remove the forms of control from the materials themselves to the task complexity of the student for which the materials act as a stimulus.

For SCOTT<sup>38</sup> prediction, inference and hypothesis are integral parts of reading. Thus we should encourage our students to make intelligent hypothesis-formation, inference and prediction while reading. For this purpose the teacher should make use of authentic materials which incorporate noticeable features such as the use of headings, titles, dates, symbols, numbers, diagrams, etc. Besides this, texts should have a number of cognate words and repeated words such as the definite article 'the' in English, or 'o, a, os, as' in Portuguese, which are frequently repeated in both languages. The teacher then makes use of the learners' experience and previous knowledge and the significant similarities between English and Portuguese to encourage the learners to apply strategies which will enable them to cope successfully with texts.

Depending on our purposes for reading, SCOTT<sup>38</sup> distinguishes three levels of comprehension:

a) **general comprehension**, knowing what the topic of the text is, and having a rough idea of what the author says

about the topic;

b) **main points comprehension**, it is the general comprehension plus an understanding of the main ideas, without grasping details;

c) **detailed comprehension**, is the comprehension of the main points plus an understanding of all or most of the less important details.

It is possible to help students reach these levels gradually and fairly quickly through the teaching of coping strategies, such as skimming, scanning, reading for main points, or for a more detailed comprehension, among others.

### **2.5.2 The Use of Simple and Simplified Materials**

WIDDOWSON <sup>49</sup> suggests a process of gradual approximation with specially written materials. The gradual approximation is a general strategy to guide the students towards being able, gradually, to handle English in discourse. This approximation begins by providing exercises within the scope of the learner's linguistic potential by making appeal to the other kind of knowledge that the learner has. Thus the starting point is the sentence and the end point is discourse. This type of exercise enables the students to associate their limited knowledge of English with their own knowledge of the subject.

Widdowson's view is that course designers should ensure the participation of the learners' knowledge and

experience to bring these to bear on their task in acquiring another language.

For HUTCHINSON and WATERS<sup>22</sup> effective materials need to incorporate four elements: 'Input', 'Language', 'Content' and 'Task'. These four elements are combined into a coherent unit: the model acts as a vehicle for leading the learner to the point where he can carry out a communication task using 'Language' and 'Content' he has absorbed in the unit. The 'Language' and 'Content' focused are drawn from the 'Input' and selected primarily according to what the learner will need in order to perform the 'Task'. The focus of the unit is the 'Task'. In the 'Task' the linguistic knowledge and the topic knowledge that are built up through the units are applied to the solving of a communication problem.

### 2.5.3 Common Core

The common core approach is the use of non-subject specific material which will satisfy students from nearly all subject areas through its content. The topics and themes are selected from different subjects such as science, history or geography. The selection of vocabulary is drawn from general interest texts common to all areas. In addition, the formal features of the language and areas of potential difficulties are presented in such a way as to enable the learner to gradually master each structure at a time or one structure combined with another. The criterion

for this combination would be simple structures to more complex ones.

Since in all registers language is used, for example, to describe structure and process, to give precise expression of spatial, temporal, and cause-and-effect relationships; to identify, define, compare, and hypothesize; to refer to and evaluate previous academic research and debate; in a common core course it is possible to outline these aspects of language and the skills which should be practiced in connection with them.

This type of structural control, together with basic vocabulary items and the selection of subject matter known to the learner will enable the low level learner to reach a certain degree of competence in the target language.

#### **2.5.4 Self-directed Learning**

Self-directed learning provides the learner with material that is not only appropriate in content and level but which he can also work at and master on his own, when and where and at the speed he chooses.

One of the objectives of ESP is to turn learners into users and one can only become a user by having opportunity to use the language. There must be a certain degree of freedom for the learners to decide when, what and how they will study. Besides working independently, the learners will have to organize their schedule and develop appropriate learning strategies for the different types of learning task they are confronted with.

### 2.5.5 Team Teaching

Team teaching is another possible feature of an ESP methodology. The defining characteristic of this 'teaming-up' is that language teachers and subject specialists work together with the common aim of helping the students. Three variants of team teaching can be mentioned: first, more than one teacher can be in the classroom at the same time; second, two teachers may either present a similar viewpoint but from different perspectives, or they may use two different viewpoints; third, teachers may never be present in the classroom at the same time, but an identical viewpoint and a common body of materials be covered by the two teachers <sup>16</sup> (p.44).

Team teaching involves more than what occurs in the classroom. The connection between team members is even more important at the planning stage. It is at this point that pedagogic and linguistic criteria can be applied to course design and can operate on the content base to produce a teaching approach that is appropriate to the students concerned.

## 2.6 MOTIVATION

The learners' motivation is considered to be crucial in the learning situation. One should not forget that motivational factors may determine or limit a learner's progress in developing second language competence, for



example. A learner may be positively or negatively motivated for many reasons. Indeed, in the learner's work or study there are several factors which may motivate him to succeed, including curiosity, desire for approval of others, status within a group, desire to finish a course, economic advantages, etc. However, motivation is variable. The learner's initial motivation may change even during the ESP course. It follows, therefore, that motivation is affected by the quality of the materials, the quality of the methods employed, by the teachers and/or by the learner's interests, anxieties and needs.

According to GARDNER and LAMBERT<sup>11</sup> (p.3) the student's orientation toward the learning situation may be **instrumental** in form if the purposes of language study reflect the more utilitarian value of linguistic achievement, such as getting ahead in one's occupation; or it is **integrative** if the student wishes to learn more about the other cultural community because he is interested in it in an open-minded way, to the point of eventually being accepted as a member of the peer group.

It is generally assumed that ESP programmes, by their nature, tend to emphasize the instrumental aspect of motivation. The utilitarian purpose of the ESP learner, and the immediate uses to which the language will be put, enhance motivation but diminish tolerance of anything which the learner may consider irrelevant to his purposes. He is positively motivated if he can readily appreciate the relationship which is established by the course content and

his needs. Thus it is up to the teacher or course designer to awaken or maintain the learner's motivation, by preparing and setting up attractive and motivating tasks or materials which will involve the learner.

As in ESP, reading is regarded as a skill of great importance to the learner and a significant part of the teacher's success in motivating his students has to do with the quality of materials and the type of exercises which he uses.

According to GRELLET<sup>14</sup> (p.18) being motivated means that we start reading a text prepared to find a number of things in it, expecting to find answers to a number of questions and specific information or ideas we are interested in. What we already know about the subject and what we are looking for are probably just as important as what we actually draw from the text. When reading, we keep making predictions which, in their turn, will be confirmed or corrected.

HOLMES<sup>18</sup> (p.5) concludes that when we predict we fit our hypothesis into our cognitive framework, our mental set, our world view. If we cannot fit something into this framework, we face difficulties in understanding. It follows from this that when learners are confronted with passages they know nothing about, they find it very difficult to comprehend and thus lose interest and readiness for learning.

Motivation and the student's awareness that the foreign language can be used to deal with topics which he is

concerned with in other subjects has led WIDDOWSON <sup>48</sup> (p.18) to propose his subject-oriented approach.

RISTOFF <sup>35</sup> (p.15) argues that people do not like to feel totally alienated from the world expressed in a text. And concludes that any text which is appealing to the student's inner contradiction is good for motivational purposes, be it technical or not.

Authentic texts are recognizably relevant to the purpose ESP learners have in mind. Authentic texts about chemical engineering are obviously what chemical engineers should study, at least, some of the time. By basing materials on texts dealing with the student's special subject the teacher may feel sure he is dealing with the sort of language the learner needs. However, the use of authentic texts can create difficulties, as we have mentioned in 2.4.4.1.

## 2.7 THE MOTHER TONGUE

Crucial to an ESP approach is the use of the mother tongue. It constitutes the learner's linguistic competence, or frame of reference, it supplies him with a set of associations which are exploited by the teacher who sets out to show the student that a large proportion of features are common in both languages. The learner assumes that meaning and structures will be similar to those of his own language. Although the strategy may not always work, this kind of

assumption is very important because it encourages him to hypothesize and then to confirm, or not, his predictions.

Students are always translating into and out of their native language. Hence 'translation' of a particular kind can be a useful pedagogic tool in an ESP programme. This particular kind of 'translation' has been called 'information transfer'<sup>27</sup>(p.13). It is based on the fact that the processes and procedures of science are the same no matter what the mother tongue of the scientist is concerned.

A set of pedagogic principles, gained from the overview of the literature of this chapter, were taken up as a basis for the design of the university ESP reading course.

In our next chapter we shall describe the practical experiment carried out together with the methodology adopted for our research.

## CHAPTER 3

### THE EXPERIMENT

#### 3.1 SUBJECTS

Three groups of ESP undergraduate students from the Federal University of Paraná were chosen to participate in the experiment carried out for this dissertation. The students involved were mostly second year undergraduate students from different courses of different subject areas of study, including Chemical Engineering, Civil Engineering, Electrical Engineering, Architecture, Physics, Chemistry, Data Processing, Forestry, Agricultural Science, Geology, Veterinary Medicine, Medicine, Pharmacology, Nursing, Food Science, Biology and Economics. Their ages ranged from 19 to 25.

The students were divided into three experimental groups. Two groups were considered mixed groups because they consisted of students from different areas of study. These groups will be referred to in this experiment as Experimental Group A (EGA) and Experimental Group B (EGB). The third group consisted of Food Science students only and will be referred to as Experimental Group C (EGC).

The number of subjects in each group was as follows:  
EGA=20 subjects, EGB=18 subjects and EGC=25 subjects\*.

Experimental Groups A and B had evening classes whereas the third group, Experimental Group C had classes during the afternoon.

The three groups were taught by the same teacher.

At the beginning of the course a questionnaire (Appendix 1) was applied to the subjects in order to investigate their motivation and interests in the course. This questionnaire was the first contact between teacher and students.

The results obtained through the questionnaires from the three experimental groups confirmed what needs analysis all over the country have shown, that the basic needs for ESP courses for academic purposes in Brazil is reading comprehension<sup>6</sup>. At the Federal University of Paraná this proved to be the reason why students register for ESP.

One must point out, however, that Experimental Group C had a different reason for registration: the ESP course is a compulsory subject in their curriculum\*\*. This is due to the amount of reading in English which they have to do for various subjects during the course\*\*\*.

\*The number of students who actually enrolled for the course was higher, however, not all of them are considered here for various reasons: some gave up the course, others missed one of the tests, while others were post-graduate students.

\*\*ESP is not obligatory for both EGA and EGB.

\*\*\*This reason only confirms the need in the academic field.

### 3.2 THE INSTRUCTIONAL PROGRAMME

The course design of the instructional programme of this study took into consideration the learners' situation and the target situation. The course was designed for groups of students who are heterogeneous in their proficiency in English, technical knowledge, skills and experience. For most students their timetable was overloaded with their subject area matters thus allowing a minimum amount of time for English.

As two of the Experimental Groups (A and B) consisted of students from different subject areas, the first step was to devise a common core syllabus which would be relevant to all students, irrespective of their individual speciality. This would also apply to the Food Science group, Experimental Group C. The objective of the syllabus was to convey basic structures and vocabulary through materials which were suitable for the students' needs.

The decision for the use of a common core syllabus was also the result of previous experience which had shown that, first, ESP students of this kind were not homogeneous in relation to their proficiency in English. In fact, English proficiency tests applied to ESP groups had demonstrated that their level was very low. Second, students asked for a medium of orientation outside the classroom.

The organization of the common core (Appendix 2) was based on **Concept in Use** and **Exploring Function** of the series

**Reading and Thinking in English**<sup>31</sup>. The choice of such series was due to the fact that they corresponded to most of the characteristics outlined under the 'Common Core' approach to ESP, already mentioned in 2.5.3, p.36. According to the authors of **Reading and Thinking** the course was designed for learners whose needs are described as 'English for Academic Purposes'. These factors matched with our idea of supplementing our ESP course and also with the objectives of the learners we had in mind.

Eight units of the two books were selected and organized, starting at the near-beginner level and leading to the pre-intermediate level. The main objective was to develop the learners' understanding in two main areas: how meaning is expressed by basic grammar and vocabulary and how these elements convey information in written discourse. The criteria adopted for the selection and gradation of the units were that of sentence and passage length, which increased from simple sentences to short texts, and also how language is used to described systems (Unit Two), their characteristics and dimensions (Unit Three), their structures and locations (Unit Four) and their functions (Unit Five). The other units were chosen on the basis of their function types of writing (casual and temporal relations, cause and effect, purpose and method, past time and chronological order).

The first unit shows how grammar is used to express different communicative functions. Four other units are built around a group of related concepts such as systems,



state of systems, structures and systems in action. The last three units deal with important function types of writing such as processes, following instructions and the evolution of systems. The vocabulary and reading passages cover a broad range of academic topics such as the solar system, insect anatomy, snakes, the human circulatory system, the ear, the eye and the camera, etc.

The idea exercised here is that of the simple and simplified versions of texts which present the language for the sake of language teaching and which relate subject matters to other areas of technical knowledge.

Using this course students were also guided to acquire general strategies for reading such as understanding cohesive devices, grasping the overall function of paragraphs, labelling diagrams or completing tables and flow charts, all of which they could then transfer to more specialized materials.

### **3.3 SUPPLEMENTARY READING MATERIALS**

Besides the use of a common core syllabus, supplementary reading materials became a necessity for the students in focus. The choice of such materials resulted from the purpose of the experiment and from the expected resistance of some students (especially from the Food Science group) to the use of a course set in a general academic context of this sort. The students' main interest

was to deal with texts related to their field using authentic samples of writing.

The policy adopted then was to select texts which were authentic in the sense proposed by MORROW (2.4.4.1, p.26) and GRELLET (2.4.4.1, p.27).

The idea that the 'academic world' of our students concerns nearly all subject matters from all sort of sources: books, magazines, newspapers, periodicals, and journals, has led us to choose topics and themes which are related not only to the students' specialized field of knowledge but also to the world around them.

Thus text selection was crucial to our study. Three categories of topics were considered in this study, texts of 'general interest', texts related to various areas of specialization and Food Science texts.

a) Texts considered of 'general interest' were those selected from a variety of sources such as periodicals including **New Scientist** and **Scientific American**, non-academic magazines such as **Newsweek**, the **Reader's Digest**, advertisements, instruction manuals, etc. The topics concerned subject matters considered within the general knowledge of the majority of the students, as well as up-to-date themes.

b) Texts related to a specific subject area were those selected from a variety of sources taken from the students specialization such as **Chemistry in Britain**, **Organic Chemistry**, **Fiber Producer**, **Quantitative Analysis**,

Virginia Medical Monthly, Cecil's Textbook of Medicine, etc. The topics and themes were concerned with more specific subject areas such as Medicine, Chemical Engineering, Civil Engineering, Electrical Engineering, Architecture, Physics, Chemistry, Data Processing, Forestry, Agricultural Science, Geology, Veterinary Medicine, Pharmacology, Nursing, Biology and Economics.

c) Food Science texts were those related to the Food Science course and to subject matters the students themselves had chosen in the questionnaires (Appendix 1). The sources were the following: Cecil's Textbook of Medicine, A Textbook of Pediatrics, Self, Review of Medical Pharmacology, Nutrition and Vitamins, etc.

Experimental Group A worked with texts considered of 'general interest'. Experimental Group B with texts related to a specific matter according to each student's speciality. And Experimental Group C worked with Food Science texts only.

### 3.4 READING COMPREHENSION

In an ESP reading course in which the main aim is reading comprehension of academic texts, such as the course designed for our experiment, various general objectives and specific objectives had to be defined before the actual teaching/learning process began. The system referred to for specifying such objectives is the one devised by MACIEL et

alii <sup>26</sup> in which they develop a set of principles concerning the implications of the process of specifying objectives to course designs and to arrange those principles in an ordered series of steps liable to be followed in a real ongoing situation. Thus the main aim of our course was broken down into three general objectives. These objectives were aimed at a course of one semestre of 60 hours:

- a) show general comprehension of a text;
- b) show main points comprehension of a text;
- c) show detailed comprehension of a text.

In turn, each general objective derived other specific objectives which entailed enabling skills students were supposed to master in order to accomplish the general objectives. This means that the specific objectives were the tasks the learners had to perform during the instructional programme:

a) General Objective One:

- 1. show the ability to scan by answering WH questions on information that is known to be present;
- 2. show the ability to skim to obtain the gist of a text;
- 3. show the ability to deduce the meaning of non-familiar lexical items, through word formation by giving the Portuguese equivalents of words formed by compounding and derivation;

4. show general comprehension by writing one paragraph which expresses the topic of a text.

b) General Objective Two:

1. show the ability to distinguish the main points from supporting details by completing a guided diagram;
2. show the ability to extract salient points to summarize by preparing a summary of a text;
3. show the ability to recognize indicators in discourse for introducing an idea and for concluding an idea.

c) General Objective Three:

1. show the ability to deduce the meaning of non-familiar words in the text through contextual clues;
2. show the ability to understand relations between parts of a text through lexical cohesion devices.

The use of authentic texts required an adequate methodology which would not only combine the materials to the teaching situation but would also aim at the general and specific objectives of the programme. The approaches advocated by ALDERSON (2.5.1, p.33) and SCOTT (2.5.1, p.34)

seemed to suit the purpose we had in mind, thus they were taken as the framework for the practical and theoretical methodology used in the instructional programme. From the beginning of the course the type of task used simulated authenticity: the labelling of diagrams, the completion of tables, skimming or scanning. The emphasis was also on activating the prior knowledge that the students brought to the text; common sense, experience and intelligence, they were encouraged to use their ability to predict, to make inferences and to guess intelligently.

General and specific objectives were achieved through the use of materials and different techniques. In one of the texts students were asked to go through the authentic reading material quickly to obtain the main idea (skimming) and to see how it was organized. Students were encouraged to make use of typographical features, cognate words, accompanying illustrations and diagrams as aids to interpreting the text.

Students were also asked to locate more specific information (scanning). With this technique only specific information such as a name, a place or a specific fact was asked for.

One of the most important points in our reading comprehension course was to show the students that there is not one type of reading but several according to one's reasons for reading. The learner should realize that he must read different kinds of material at different rates and with differing amounts of attention. GRELLET<sup>14</sup> (p.17)

argues that "by reading all texts in the same way, students would waste time and fail to remember points of importance to them because they could absorb too much non-essential information".

Prediction was one type of skill practiced during the course. Students were encouraged to predict text content from the title, to ponder the topic in advance and to formulate questions that they expected to be answered by the text. This aimed at encouraging them to use their background knowledge, grammatical, logical and cultural clues, sometimes compensating for the lack of full content or linguistic comprehension. SMITH's<sup>45</sup> definition of comprehension is appropriate here: "it is the reduction of uncertainty". When students predict they make a series of syntheses, using all the information they can to arrive at comprehension.

Strategies to develop the students' ability to cope with unfamiliar words in texts were dealt with during the course. Exercises were provided which ensured that students would infer in attempting to discover the meaning of unknown elements in the context by making use of syntactic, logical and cultural clues. Sometimes, reference to word formation and derivation was necessary.

Another area on which we based our exercises was in the recognition of various devices used to create textual cohesion and the use of reference. Exercises were devised to help students to recognize textual reference (anaphoric and cataphoric) and discourse markers (conjunctions) such

as: 'however', 'then', 'so that', 'likewise', 'in addition', etc., which are important for the students to realize that a text is not made up of independent sentences and clauses.

Other types of exercises were: information transfer, which is the representation of some or all of the information in the text in an alternative form, such as graphs, tables, diagrams, flow charts or even in the form of a summary in the students' native language; translation of compound-nouns and gap-filling based on verbal and non-verbal information. (Appendix 3).

### 3.5 THE USE OF DICTIONARY

Students are encouraged to make guesses at the meaning of unknown words they do not know or use the context rather than look the words up in a dictionary. If they need to look at the dictionary to get a precise meaning then they should only do so after having tried to work out a solution on their own.

Frequently, words are actually defined in a text, so that if students can recognize a definition, they need not look up the word. Students should be made aware of the fact that exact dictionary definitions are usually unnecessary for the understanding of a text.

However, the use of a dictionary was allowed by all students of the three Experimental Groups during their instructional programme because this is what normally



happens outside the classroom. The only exception occurred in the pre-test. As students usually do not have a dictionary in the first classes of the course, its use was not allowed in the pre-test nor, consequently, in the post-test.

### 3.6 PRE-TEST

A pre-test (Appendices 4-13) was applied to the three Experimental Groups before the instructional programme. The test was especially organized for the study of this dissertation.

The objectives of the pre-test were:

- a) to determine the students' knowledge of English in basic grammar and vocabulary;
- b) to measure the students' capacity in general comprehension of a text written in English.
- c) to measure the students' capacity in comprehension of the main points of a text;
- d) to measure the students' capacity in detailed comprehension of a text.

The pre-test was divided into three parts and the score of each part was 20 points.

#### 3.6.1 First Part (Appendix 4):

The objective of this part, which tested detailed comprehension at a micro-level, was to determine the

students' level of English in basic grammar and vocabulary. This part consisted of a 'cloze test' with multiple choice, where the students were asked to read the whole passage carefully then choose the best alternative to complete it. The reason for choosing this type of exercise was because it seemed appropriate for the purpose of our study: it was our intention to test reading comprehension of a simple paragraph in which basic grammar and vocabulary were included. The multiple choice answers were appropriate to the aim of the course, the students would not be taught how to 'produce' the language but rather to read and understand. Furthermore, this part was selected from the 'Teste de Nivelamento' which had been prepared and tested by the ESP group of teachers at the Federal University of Paraná and which had, at a later stage, been subject to a statistical item analysis.

### 3.6.2 Second Part (Appendix 5):

The objective of this part was to measure the students' ability to recognize general, main points and detailed comprehension of a text written in English. This part consisted of a text: **Pesticides: Exporting Death\*** with questions at all levels of comprehension.

\*New Scientist 16 August 1984.

The reason for choosing this text was due to the fact that it was selected from **New Scientist** which is a magazine produced for the educated layman and the article is considered to be of general interest to the non-specialist. This was appropriate for the students of the three Experimental Groups and for the purpose of our experiment.

The questions were formulated in Portuguese, and the students were also supposed to answer them in Portuguese. The type of questions were related to the three levels of comprehension, for example: "What is the general idea of the text?", "What is the translation of the following compound-nouns?". There were, in addition, questions on 'main points comprehension'. Students were not allowed to use the dictionary.

### 3.6.3 Third Part (Appendices 6-13):

The objective of this part was identical to the second part: to measure the students' ability to recognize general, main points and detailed comprehension of a text written in English. This part consisted of a text selected according to each student's specific subject matter. Thus, the text: **Endocrine Mechanism in Nutritional Adaptation**, for Food Science students, the text: **Air, a Measure of Pollution**, for Chemistry students, the text: **Doing Physics with Microcomputers**, for Physics students, etc.

The type of questions followed the same pattern of questions of the second part.

Students were asked to answer the questions in Portuguese and they were not allowed to use the dictionary.

### **3.7 POST-TEST**

The same pre-test was applied as a post-test at the end of the instructional programme as an identical means of measuring the students' performance during the experiment.

## CHAPTER 4

### STATISTICAL ANALYSIS AND DISCUSSION OF RESULTS

#### 4.1 DATA COLLECTION

##### 4.1.1 Procedure

Before we present the results of our experiment we shall discuss the procedures followed for the collection of data. It has been mentioned previously that each experimental group was given the same pre-test and post-test, as described in the preceding chapter.

The pre-test and the post-test were corrected by the author of this dissertation.

Although the pre-test was applied at the beginning of the instructional programme, that is, at the beginning of the semestre, its correction was done together with the correction of the post-test at the end of the semestre. The reason for this was to avoid possible difference on the judgement of the answers that the span of time might influence.

Each part of the tests was worth 20 points.

We shall now describe the procedure followed for the collection of data of each part of the pre-test and the post-test.

#### 4.1.1.1 first part (Appendix 4):

A 'cloze test' in which the students were asked to complete the passage by choosing the best alternative from multiple choices. The alternatives were selected so as to provide one answer for each blank, thus each score corresponded to one blank. The scores for the pre- and post-test for each student was taken down and recorded in Table 1, p.61.

#### 4.1.1.2 second part (Appendix 5):

This part consisted of a general interest text: **Pesticides: Exporting Death**, with questions at all levels of comprehension. For the statistical analysis of this part, questions I and II, which concerned the global theme of the text, were not computed. The reason for this was that these questions were only intended to prepare the students for the reading of the whole text. Questions III and VIII were prepared so as to provide answers which could be assigned a score rank of 1 to 6 points each. Thus question VII, for example, required the translation of 6 items which corresponded to 6 points each answer.

The pattern of scores for this specific text and part was as follows:

Question	III	=	2	scores
Question	IV	=	3	scores
Question	V	=	4	scores
Question	VI	=	1	score
Question	VII	=	6	scores
Question	VIII	=	4	scores
Total				= 20 scores

TABLE 1. First Part: 'Cloze Test' in basic grammar and vocabulary.

P	PRE-TEST						POST-TEST					
	EGA		EGB		EGC		EGA		EGB		EGC	
	N	%	N	%	N	%	N	%	N	%	N	%
0	1	5.0	1	5.6	1	4.0	-	-	-	-	-	-
1	1	5.0	1	5.6	1	4.0	-	-	-	-	-	-
2	2	10.0	1	5.6	-	-	-	-	-	-	-	-
3	-	-	2	11.1	2	8.0	1	5.0	-	-	-	-
4	1	5.0	2	11.1	4	16.0	-	-	-	-	2	8.0
5	-	-	-	-	2	8.0	-	-	-	-	-	-
6	1	5.0	4	22.2	2	8.0	-	-	2	11.1	-	-
7	1	5.0	1	5.6	3	12.0	1	5.0	1	5.6	5	20.0
8	1	5.0	1	5.6	5	20.0	-	-	2	11.1	3	12.0
9	2	10.0	3	16.7	2	8.0	-	-	-	-	4	16.0
10	2	10.0	1	5.6	-	-	4	20.0	4	22.2	1	4.0
11	3	15.0	-	-	-	-	3	15.0	1	5.6	2	8.0
12	1	5.0	-	-	1	4.0	2	10.0	1	5.6	3	12.0
13	1	5.0	-	-	1	4.0	-	-	1	5.6	1	4.0
14	1	5.0	-	-	-	-	3	15.0	1	5.6	-	-
15	2	10.0	-	-	-	-	3	15.0	1	5.6	2	8.0
16	-	-	1	5.6	1	4.0	1	5.0	1	5.6	-	-
17	-	-	-	-	-	-	-	-	1	5.6	1	4.0
18	-	-	-	-	-	-	2	10.0	2	11.1	-	-
19	-	-	-	-	-	-	-	-	-	-	1	4.0
20	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	20	100.0	18	100.0	25	100.0	20	100.0	18	100.0	25	100.0

EG = Experimental Groups (A, B and C).

N = Absolute frequency.

P = Number of points.

% = Relative frequency.

The scores for the pre- and post-test for each student was taken down and recorded in Table 2, p.63.

#### 4.1.1.3 third part (Appendices 6-13):

This part concerned texts selected according to each student's subject matter. As the objective of this part was to test students' level of comprehension, the questions were also at all levels of comprehension.

The questions were selected so as to provide answers which could be assigned a score rank of 1 to 6 points. As in the Second Part, the pattern of scores varied according to each question and the answer(s) required.

Each text offered different types of questions. Thus, for example, in the text selected for Food Science students, the following pattern of scores was used:

Question	III	=	3	scores
Question	IV	=	2	scores
Question	V	=	2	scores
Question	VI	=	1	score
Question	VII	=	2	scores
Question	VIII	=	6	scores
Question	IX	=	<u>4</u>	<u>scores</u>
	Total	=	20	scores

As in the Second Part, questions I and II were not computed.

The scores for the pre- and post-test for each student was taken down and recorded in Table 3, p.64.



TABLE 2. Second Part: General Interest text:Pesticides: Exporting Death.

P	PRE-TEST						POST-TEST					
	EGA		EGB		EGC		EGA		EGB		EGC	
	N	%	N	%	N	%	N	%	N	%	N	%
0	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	2	8.0	-	-	-	-	-	-
2	1	5.0	2	11.1	3	12.0	-	-	-	-	-	-
3	1	5.0	4	22.2	4	16.0	1	5.0	-	-	-	-
4	1	5.0	2	11.1	8	32.0	-	-	-	-	1	4.0
5	5	25.0	3	16.7	3	12.0	2	10.0	1	5.6	3	12.0
6	1	5.0	-	-	5	20.0	-	-	2	5.6	2	4.0
7	3	15.0	2	11.1	-	-	2	10.0	2	11.1	3	12.0
8	3	15.0	1	5.6	-	-	3	15.0	2	11.1	2	8.0
9	-	-	2	11.1	-	-	1	5.0	2	11.1	2	8.0
10	-	-	-	-	-	-	1	5.0	2	11.1	4	16.0
11	2	10.0	1	5.6	-	-	-	-	2	11.1	2	8.0
12	1	5.0	-	-	-	-	4	20.0	2	11.1	1	4.0
13	-	-	-	-	-	-	1	5.0	3	16.7	2	8.0
14	1	5.0	-	-	-	-	3	15.0	-	-	2	8.0
15	-	-	1	5.6	-	-	-	-	-	-	1	4.0
16	1	5.0	-	-	-	-	-	-	-	-	1	4.0
17	-	-	-	-	-	-	2	10.0	1	5.6	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	20	100.0	18	100.0	25	100.0	20	100.0	18	100.0	25	100.0

EG = Experimental Groups (A, B and C).

N = Absolute frequency.

P = Number of points.

% = Relative frequency.

TABLE 3. Third Part: Specific Texts.

P	PRE-TEST						POST-TEST					
	EGA		EGB		EGC		EGA		EGB		EGC	
	N	%	N	%	N	%	N	%	N	%	N	%
0	-	-	1	5.6	-	-	-	-	-	-	-	-
1	1	5.0	-	-	1	4.0	-	-	-	-	-	-
2	1	5.0	-	-	2	8.0	-	-	1	5.6	-	-
3	3	15.0	-	-	7	28.0	1	5.0	-	-	-	-
4	1	5.0	2	11.1	5	20.0	-	-	-	-	-	-
5	1	5.0	1	5.6	3	12.0	1	5.0	1	5.6	3	12.0
6	1	5.0	4	22.2	4	16.0	3	15.0	1	5.6	2	8.0
7	2	10.0	1	5.6	-	-	1	5.0	-	-	7	28.0
8	-	-	3	16.7	1	4.0	1	5.0	3	16.7	2	8.0
9	2	10.0	1	5.6	1	4.0	1	5.0	1	5.6	3	12.0
10	1	5.0	1	5.6	-	-	3	15.0	3	16.7	2	8.0
11	2	10.0	3	16.7	-	-	-	-	2	11.1	1	4.0
12	2	10.0	1	5.6	1	4.0	3	15.0	2	11.1	3	12.0
13	1	5.0	-	-	-	-	-	-	1	5.6	-	-
14	2	10.0	-	-	-	-	2	10.0	2	11.1	-	-
15	-	-	-	-	-	-	2	10.0	1	5.6	2	8.0
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	2	10.0	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	20	100.0	18	100.0	25	100.0	20	100.0	18	100.0	25	100.0

EG = Experimental Groups (A, B and C)

N = Absolute frequency.

P = Number of points.

% = Relative frequency.

#### 4.2 CHOICE OF STATISTICAL TEST

After collecting the data to test our hypothesis concerning the most adequate and efficient procedure to develop reading skills, statistical tests were carried out.

In order to analyse the results of our research, we have made use of one type of nonparametric test, namely the t-test and the statistical measure known as the analysis of variance.

The t-test was chosen because it is an appropriate statistical test to the research we have in mind; it enables us to determine whether the difference between the pre-test means and the post-test means for each of the experimental groups is significant.

For such a set of results the t-test is appropriate, however, when more factors are involved, such as the different groups and the different parts of a pre-test and a post-test, the analysis of variance (ANOVA) is most appropriate. Thus its use in the processing of data of this experimental research.

The data collected were processed and computerized at the Computer Centre of the Federal University of Paraná according to the Statistical Package for Social Sciences (SPSS) which is an integrated system of computer programme designed for the analysis of social science data.

#### 4.3 RESULTS AND DISCUSSION OF THE PRE- AND POST-TEST ACCORDING TO THE ANALYSIS OF VARIANCE

The analysis of variance (ANOVA) allowed us to compare the three experimental groups mean scores simultaneously on the pre- and post-test.

The results are displayed according to three factors:

**Factor A** presents the global mean scores of the three experimental groups (EGA, EGB and EGC) in relation to each part of the pre- and post-test.

**Factor B** presents the global mean scores of each part of the tests (1st, 2nd and 3rd) in relation to each experimental group.

**Factor A x B** presents the interaction of each part of the pre- and post-test with each experimental group on overall scores.

a. Table 4 presents the results obtained from the analysis of variance in the pre-test and post-test in Factor A.

TABLE 4. **Factor A:** global mean scores of the three experimental groups (EGA, EGB and EGC) in relation to each part of the pre- and post-test.

	PARTS AND GROUPS			F	Sig. of F
	1st	2nd	3rd		
Pre-test	7.05	5.57	6.38	2.88	0.058
Post-test	11.19	9.95	9.56	3.58	0.030

The results displayed in Table 4 show that in Factor A the effect of each part of the test on the groups was not a significant one. However, this effect was significant in the post-test.

b. Table 5 presents the results obtained from the analysis of variance in the pre- and post-test in Factor B:

TABLE 5. Factor B: global mean scores of each part of the tests (1st, 2nd and 3rd) in relation to each experimental groups.

	GROUPS AND PARTS			F	Sig. of F
	EGA	EGB	EGC		
Pre-test	7.92	6.41	5.01	11.80	0.000
Post-test	11.02	10.52	9.40	3.64	0.028

The results in Table 5 demonstrates that the groups were significantly different from each other in both tests, pre- and post-test.

c. Table 6 presents the results obtained from the analysis of the interaction of Factor A and B in the pre- and post-test:

TABLE 6. **Factor A x B:** interaction of each part of the tests (1st, 2nd and 3rd) with each experimental group (EGA, EGB and EGC) on overall scores.

		PARTS x GROUPS			F	Sig.of F
		EGA	EGB	EGC		
Pre-test	1st	8.50	6.06	6.60	1.39	0.239
	2nd	7.45	5.83	3.88		
	3rd	7.80	7.33	4.56		
Post-test	1st	12.30	11.61	10.00	0.28	0.890
	2nd	10.35	10.06	9.56		
	3rd	10.40	9.89	8.64		

The results displayed in Table 6 show that in the interaction of Factor A and B there is no significant difference.

#### 4.3.1 Discussion of the Results

When reviewing the results obtained from the analysis of variance, one must consider the following facts:

a. Factor A indicates that at the beginning of the course the experimental groups made similar gains in proficiency overall, no matter which part of the pre-test; that is, the groups did not respond differently to these parts. However, at the end of the instructional programme, the groups did respond differently to one or all the parts of the test. This will be further discussed when we analyse the results of the t-test.

b. Factor B indicates that the three experimental groups were significantly different from each other in both pre- and post-test. This is due to the fact that the groups chosen to participate in this experiment were those of the actual situation in the Federal University of Paraná. Thus the heterogeneity of the groups in terms of English language proficiency, background knowledge, academic subject area, academic year, etc. Nevertheless, it is worth noting the marked change from heterogeneous groups ( $F=11.80$ ) to homogeneous groups ( $F=3.67$ ) by the end of the course. This may be due to the effect of instructional treatment during the ESP course.

c. As seen from the results, in Factor A x B the effect of the interaction between the parts and the groups was not significant on both pre- and post-test. This means that one method of treatment was no more beneficial to one group than the other and also that the groups did not show greater gains when tested on one part as opposed to another.

Although the ANOVA show no significant difference in this interaction we shall notice meaningful differences in the mean scores (t-test) between the groups in the next section of this chapter.

In addition to the results of these factors, the SPSS statistical package has also provided the Bartlett-Box  $F$ 's results (Appendices 14, 15) on the Test of Homogeneity of variance. The results confirm that in the pre-test the experimental groups were not homogeneous ( $p=0.011$ ) whereas

in the post-test they were homogeneous ( $p=0.394$ ). This markedly result leads to the assumption that treatment effect was highly significant.

#### 4.4 RESULTS AND DISCUSSION OF THE PRE- AND POST-TEST ACCORDING TO THE RESULTS OF THE T-TEST

a. Table 7 shows the results of the data obtained in relation to the performance of the students in the pre- and post-test in the First Part which concerns the students' basic knowledge of grammar and vocabulary.

TABLE 7. Results of the First Part of the Pre- and Post-Test.

	N	PRE-TEST		POST-TEST		DIF.*	T-value	2 -Tail Prob.
		$\bar{X}$	SD	$\bar{X}$	SD			
EGA	20	8.50	4.66	12.30	3.62	3.80	-5.73	0.000
EGB	18	6.05	3.84	11.61	3.98	5.55	-9.16	0.000
EGC	25	6.60	3.61	10.00	3.74	3.40	-5.75	0.000

\*Difference between the mean score of the pre-test with the post-test.

It can be seen that the three groups of students performed better on the post-test than on the pre-test. The improvement, however, is far greater in Experimental Group B, which worked with specific texts, than in the other two groups; while the difference between the mean score of the two tests in Experimental Group B is 5.55, an improvement of



over 50%, the differences between the two other groups are 3.80 and 3.40, an improvement of about 30%.

Experimental Group A, which worked with general interest texts, scored the largest Standard Deviation result in the pre-test (4.66), which means that there is more variability from the central point in the distribution. Experimental Groups B and C (Food Science group) scored smaller SD in the pre-test (3.84 and 3.61) thus being closer to the central point. The SD in the post-test of the three experimental groups did not differ significantly (EGA=3.62, EGB=3.98 and EGC=3.74).

The t-value of the three experimental groups rejected the null hypothesis. The observed value of t (9.16) in EGB is higher than the other two groups. It is statistically significant because it is greater than the t-value of the intersection ( $9.16 > 2.11$ ,  $\alpha = 0.5$ ). Although the t-values of the other two groups are statistically significant the difference between them is not greater than EGB,  $EGA=t=5.73 > 2.09$ ,  $\alpha = .05$  and  $EGC=t=5.75 > 2.06$ ,  $\alpha = .05$ ).

The 2-Tail Probability indicates that the results obtained in the three experimental groups (0.000) were not due to chance because they are smaller than the level of significance 0.025. (Although the level of significance was .05 we have had to divide it into two giving an .025 area to each tail of the distribution.)

There were noticeable differences between the three groups in the range of scores in the pre-test and the post-test. The results are presented in Fig.1, p.73.

Fig.1 demonstrates that more students in EGA achieved higher scores in the post-test, than students from the other two groups. On the other hand, more students in EGB and EGC got lower grades in the pre-test, than students from EGA. It should be noticed that more students in EGC had lower grades in the post-test, than students from the other two groups. This means that students from EGC achieved lower grades in both tests.

b. Table 8 shows the results of the data obtained in relation to the performance of the students in the pre-test and the post-test in the Second Part which concerns the students' reading comprehension of a general interest text:

TABLE 8. Results of the Second Part of the Pre- and Post-test.

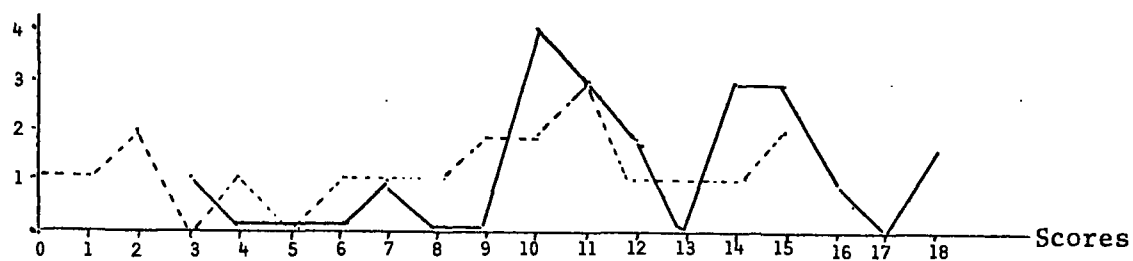
	N	PRE-TEST		POST-TEST		DIF.*	T-value	2-Tail Prob.
		$\bar{X}$	SD	$\bar{X}$	SD			
EGA	20	7.45	3.67	10.35	3.96	2.90	-5.12	0.000
EGB	18	5.83	3.50	10.05	3.01	4.22	-8.76	0.000
EGC	25	3.88	1.53	9.56	3.39	5.68	-9.80	0.000

\*Difference between the mean score of the pre-test with the post-test.

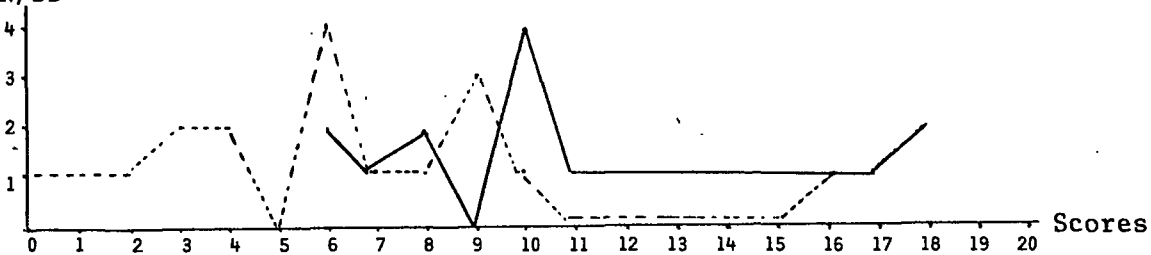
As in the First Part, the three groups of students performed better in the post-test than in the pre-test. The difference between the mean score of the pre-test with the post-test of EGC is 5.68, an improvement of over 50%, while the difference of the other two groups reached 25% and 40%.

**EXPERIMENTAL GROUP A**

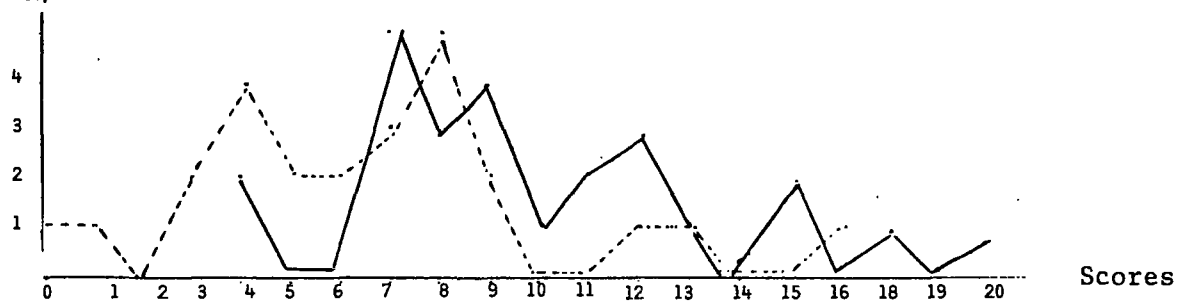
N/Ss

**EXPERIMENTAL GROUP B**

N/Ss

**EXPERIMENTAL GROUP C**

N/Ss



----- Pre-test  
 ————— Post-test  
 maximum score: 20

Fig. 1. Range of scores in the First Part of the Pre-test and Post-test.

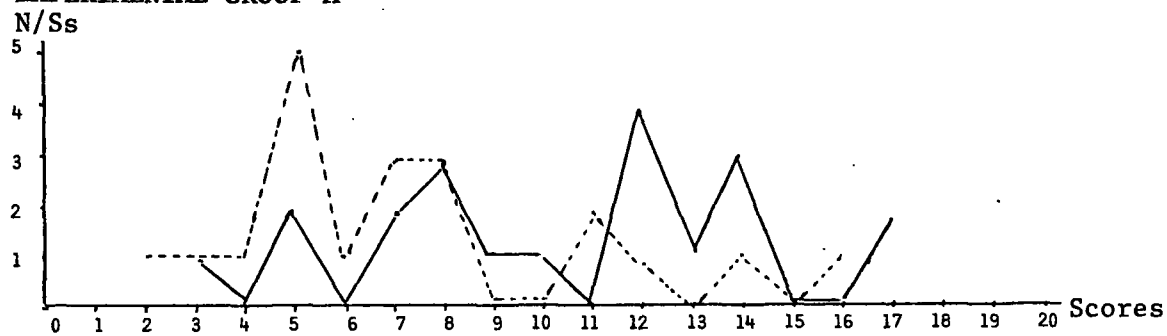
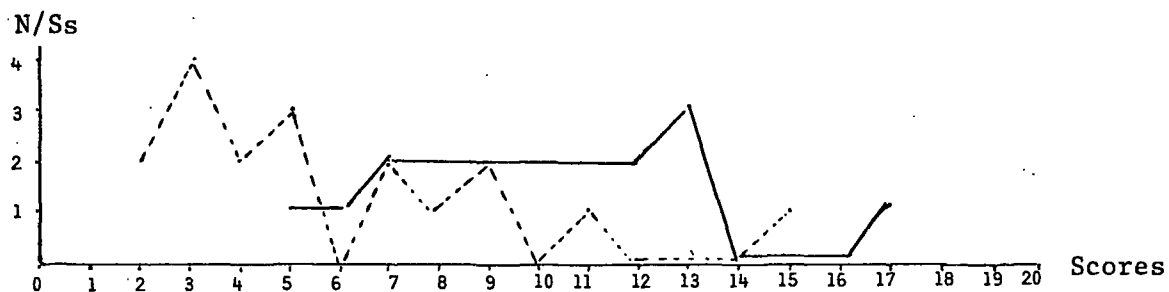
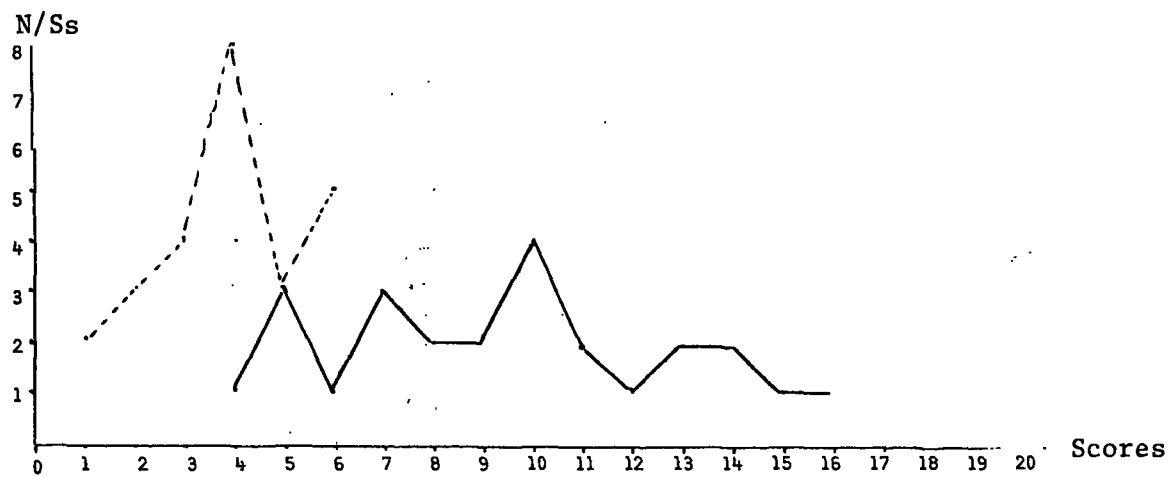
EGA scored the largest SD in the post-test (3.96), which means that there is more variability from the central point in the distribution. The difference in the SD of the other two groups in the post-test is not great, EGB=3.01 and EGC=3.39. However, there is a greater difference between the lowest SD of EGC=1.53 in the pre-test in relation to the other two groups in the same pre-test, EGA=3.67 and EGB=3.50. This means that EGC is closer to the central point in the students' performance in the pre-test.

The t-value of the three experimental groups rejected the null hypothesis because their observed value is much greater than the t-value of the intersection. EGC scored the highest observed value of  $t$  ( $t=9.80 > 2.06$ ,  $\alpha = .05$ ), which means that it is statistically significant. Although the t-value of the other two groups are statistically significant, the difference between them is not greater than the t-value of EGC,  $EGB=t=8.78 > 2.11$ ,  $\alpha = .05$  and  $EGA=t=5.12 > 2.09$ ,  $\alpha = .05$ .

The 2-Tail Probability indicates that the results obtained in the three experimental groups (0.000) were not due to chance because they are smaller than the level of significance .025.

Data regarding the range of scores between the three experimental groups are presented in Fig.2, p.75.

Fig.2 indicates that the majority of the students in EGC got lower grades in the pre-test than in the post-test. It should be noticed that there is a clear distinction between the grades achieved in the pre-test with those

**EXPERIMENTAL GROUP A****EXPERIMENTAL GROUP B****EXPERIMENTAL GROUP C**

----- Pre-test  
 ————— Post-test  
 maximum score: 20

Fig. 2. Range of scores in the Second Part of the Pre-test and Post-test.

achieved in the post-test. This clear distinction is not evident in relation to the other two groups, although the students in EGB have also scored a considerable percentage of lower grades in the pre-test. The performance of the students in EGA and EGB in the post-test is not contradictory because the distribution of low grades and high grades is equal. This is not so in relation to EGC in which there is a greater number of lower grades in the post-test than higher grades.

c. Table 9 shows the results of the data obtained in relation to the performance of the students in the pre- and post-test in the Third Part which concerns the students' reading comprehension of a specific text related to their subject area:

TABLE 9. Results of the Third Part of the Pre- and Post-test.

	N	PRE-TEST		POST-TEST		DIF.*	T-value	2-Tail Prob.
		$\bar{X}$	SD	$\bar{X}$	SD			
EGA	20	7.80	4.25	10.40	4.13	2.60	-6.11	0.000
EGB	18	7.33	3.08	9.88	3.37	2.55	-4.60	0.000
EGC	25	4.56	2.41	8.64	2.87	4.08	-6.93	0.000

\*Difference between the mean score of the pre-test with the post-test.

Table 9 confirms that the three groups of students performed better in the post-test than in the pre-test.

As in Table 8, the improvement of EGC is greater than the other two groups, 4.08 (40%), while the difference between the other two groups are: EGA=2.60 and EGB=2.55, an improvement of about 25%.

EGA scored the highest mean score in the pre-test (7.80) while EGC scored the lowest (4.56). Likewise, EGA scored the highest mean score in the post-test (10.40) and EGC scored the lowest (8.64).

There is more variability from the central point in the pre-test in EGA ( $SD=4.25$ ) while EGC is closer to the central point ( $SD=2.41$ ). EGA also scored the largest SD in the post-test (4.13) and EGC the lowest (2.87).

The t-value of the three experimental groups rejected the null hypothesis because their observed value is much greater than the t-value of the intersection. Although the three groups are statistically significant, EGC has a much greater t-value ( $t=6.93 > 2.06$ ) than the other two groups,  $EGA=t=6.11 > 2.09$  and  $EGB=t=4.60 > 2.11$ .

The 2-Tail Probability indicates that the results obtained in the three experimental groups (0.000) were not due to chance because they are smaller than the level of significance 0.025.

There were also noticeable differences between the three groups in the range of scores in the pre-test and the post-test. The data regarding the range of scores between the three groups are presented in Fig.3, p.79.

Fig.3 shows that more students in EGC achieved lower grades in the pre-test, than the students from the other two groups. More students in EGA achieved higher grades in the pre-test. Fig.3 also indicates that the same number of students in EGA and EGB achieved higher and lower grades in the post-test. This did not occur with students in EGC, in which more students achieved lower grades than higher grades.

#### **4.4.1 Discussion of the Results**

The statistical procedures have permitted us to draw a number of hypotheses which might explain the significant results obtained at the end of the experiment carried out for this dissertation.

The discussion of each section of the pre- and post-test will follow the order adopted for the presentation of the results.

##### **4.4.1.1 first part**

As seen from the results, EGB, which worked with specific texts, outperformed both EGA and EGC in this section of the pre- and post-text. Contrary to what we had expected, EGA which had outscored the two other groups in the pre-test, did not outperformed EGB and EGC in the post-test. An indication of why this is so is given by the Standard Deviation in the pre-test (4.66). This very large



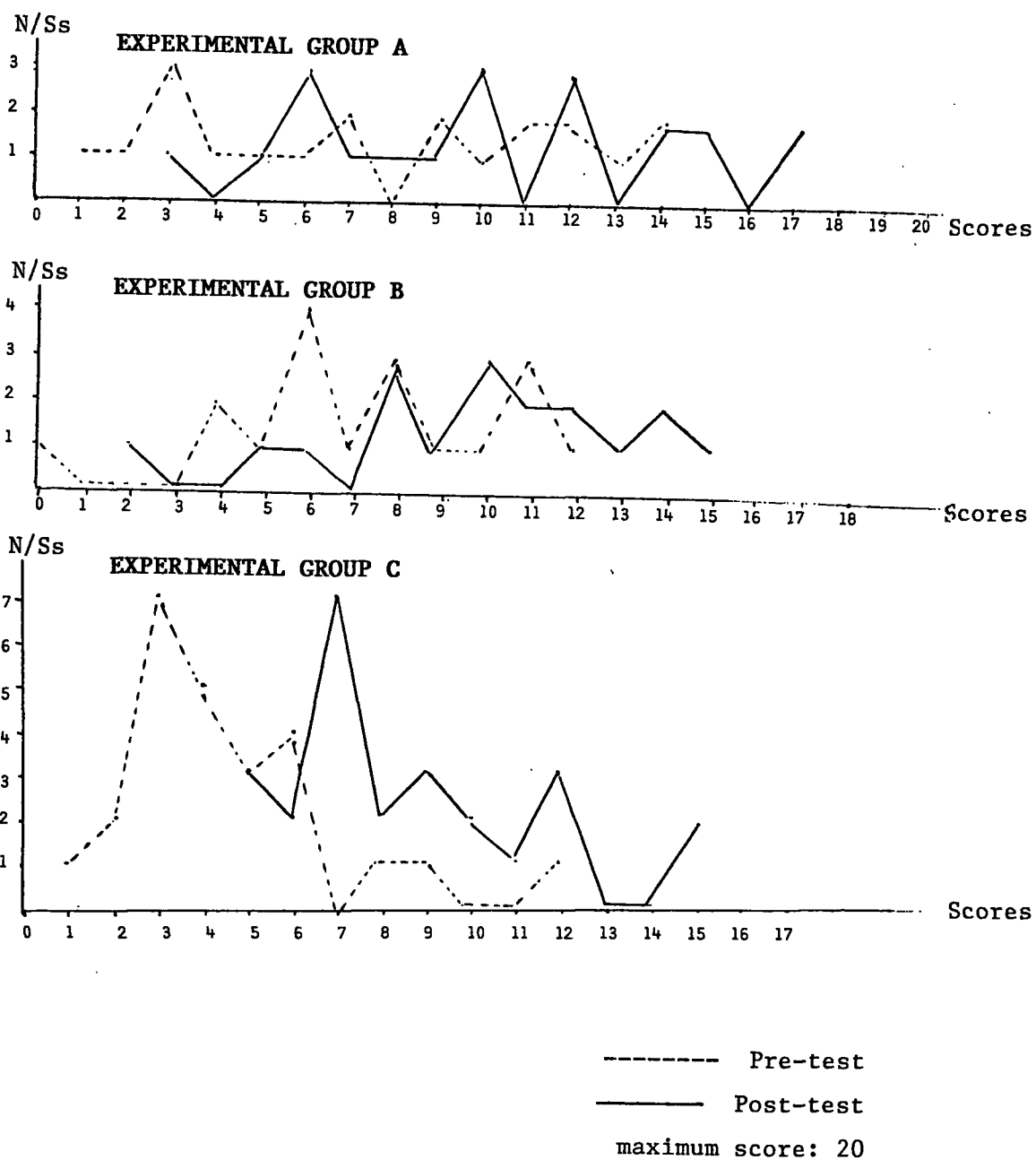


Fig.3. Range of scores in the Third Part of the Pre-test and Post-test.

SD, means that there is more variability from the central point in the distribution. This heterogeneity might account for the group's poor performance at the end of the instructional programme. However, it is worth noting that the SD of this group was the smallest (3.62) in the post-test.

There is no way to know for certain why EGB scored 50% higher than the other two groups in the post-test; one might relate the fact that having worked with specific texts, the students in EGB have tended to treat texts as samples to be exploited for all they offer in terms of vocabulary, grammar, word association, structures, etc. This procedure might have encouraged students to read slowly and carefully, in spite of the approach envisaged for the ESP course of this experiment.

If, on the one hand, specific texts were an advantage to EGB in this sort of detailed comprehension at a micro-level, the same did not occur with EGC which also worked with specific texts related to Food Science.

#### **4.4.1.2 second part**

As can be seen from the statistical results, EGC (Food Science group) has scored 40% higher than both EGA and EGB in the second part of the pre- and post-test.

On the basis of these results two explanations are plausible. One explanation might be the fact that ESP reading materials related to the students' subject area of study help students' reading comprehension performance on

general interest texts. A second explanation concerns the fact that EGC, although being the less proficient group in the experiment, is a more homogeneous group in terms of subject area of study, academic year, interests and motivation (these two items will be discussed later on). This fact alone might not account for the group's high performance at the end of the instructional programme. However, homogeneity plus students' background knowledge might have contributed to the final result. As Smith and Goodman point out in their psycholinguistic models, the reader is selective, taking advantage of his knowledge of one factor (e.g. background knowledge) to overcome his lack of control over another factor (e.g. linguistic proficiency). In the case of EGC background knowledge may have affected their high performance as a whole.

The fact that EGB did not outperform EGC lends support to the hypothesis that homogeneous groups perform better than heterogeneous groups in terms of subject area, as is the case of EGB which worked with specific texts but consisted of students from different areas of study.

In this section of the test, EGA should have been at an advantage for having worked with general interest texts during the course, however, in view of the results, this did not prove to be the case. One possible reason might be related to the heterogeneity of the group in terms of linguistic proficiency and/or background knowledge, which might have influenced the group's performance.

#### 4.4.1.3 third part

The pattern of results presented in Table 9, confirms our hypotheses in the previous discussion (4.4.1.2), namely, that EGC might have performed better than the other two groups for two plausible explanations. They also confirm the hypothesis that homogeneous groups perform better than heterogeneous groups in terms of different subject area students.

The fact that EGA and EGB performed in a very similar way in this section of the test, which tested reading comprehension on students' specific subject area, upsets predictions: First, EGB should have performed better than EGA because of the specific text treatment the group received during the instructional programme. Second, EGA did not work with specific texts and its performance was similar to EGB. These facts lead to several assumptions: 1. methodology may have helped to improve EGA's reading comprehension performance on specific texts in spite of the fact that the group worked with general interest texts; 2. students' background knowledge may have contributed to EGA's overall performance; 3. poor linguistic proficiency may have affected EGB's reading comprehension performance and 4. students' background knowledge and subject specific texts may have balanced EGB's performance.

#### 4.5 STATISTICAL ANALYSIS OF THE QUESTIONNAIRES

In order to investigate whether the subjects' motivation and interests towards the ESP course would have any influence upon their reading comprehension performance at the end of the instructional programme, an analysis has been conducted based on the data obtained from the questionnaires (Appendix 1) applied at the beginning of the ESP course.

In this analysis the scores were converted to percentages for standardization purposes.

##### 4.5.1 Results and Discussion

Together with the presentation of the results there will be a brief discussion on each item of the questionnaire. Some of these items will be referred to on our final discussion.

The order of presenting the results and discussion will be that of the original questionnaire.

##### 4.5.1.1 section i (Personal Information)

As questions 1 to 3 refer to the subjects' personal information they were not computed here. Reference to the subjects' course of study (question 4) has already been made when we described the subjects of our experiment (3.1, p.43). The mean score of each subject's academic year (question 5) is presented in Table 10:

TABLE 10. Mean score of subject's academic year.

ACADEMIC YEAR	EGA (%)	EGB (%)	EGC (%)
1st	-	5.5	-
2nd	40.0	33.3	100.0
3rd	40.0	44.4	-
4th	10.0	11.1	-
5th	10.0	5.5	-

Table 10 shows that the majority of students who participated in our experiment were mostly second and third year students. It should be pointed out that 100% of the Food Science students were second year students. This means that EGC is a more homogeneous group in terms of students' academic year. This is due to the fact that ESP is a compulsory subject in Food Science course.

#### 4.5.1.2 section ii (Motivation towards the ESP Course)

In this section those items which were not scored by the students were not computed here.

Table 11 presents the subjects' mean scores on each item of the section:

TABLE 11. Mean score of student's motivation towards ESP course.

	EGA (%)	EGB (%)	EGC (%)
a. compulsory subject in the course	5.0	5.5	64.0
b. necessity of ESP course within main course of study	40.0	44.4	-
c. needs ESP to undertake other courses (MA, PhD, etc.)	15.0	5.5	4.0
d. likes English	5.0	5.5	8.0
e. thinks it is important to know English	30.0	33.3	24.0

As seen in Table 10, EGA and EGB have very similar mean percentages. The necessity of an ESP course within the students' main course of study is felt by approximately 40% of the students in both EGA and EGB.

In the case of EGC, for which ESP is a compulsory subject, there could be no other indication because the students were asked to make only one choice in this item of the questionnaire. Nevertheless, 36% of the students added other alternatives.

#### 4.5.1.3 section iii (1. Interest on the Course)

The students' mean percentages are presented in Table 12:

TABLE 12. Students' mean percentage on Interest in the ESP course.

	EGA (%)	EGB (%)	EGC (%)
a. reading comprehension	90.0	94.0	96.0
b. listening	5.0	-	4.0
c. speaking	5.0	5.0	-

As Table 12 shows, reading comprehension scored the highest in all three experimental groups. This result is noteworthy in relation to EGC because it reflects the students' interest and necessity of reading comprehension although ESP was a compulsory subject for them.

#### 4.5.1.4 section iii (2. Percentage of students' specific bibliography)

This section concerns the students' specific bibliography which they would like to be used in the ESP course. Table 13 presents the subjects' mean scores.

TABLE 13. Student's mean scores on specific bibliography.

RANK OF SCORES	EGA (%)	EGB (%)	EGC (%)
100.0	10.0	11.1	4.0
75.0	25.0	38.8	68.0
50.0	50.0	33.3	28.0
25.0	10.0	16.6	-
0.0	-	-	-



As seen in Table 13, the percentage of specific bibliography wanted to be used during the course, is between 50% to 75%. The table also indicates that 68% of the Food Science students ranked 75% as the percentage of bibliography they would like to be used. This suggests that EGC is more motivated to using specific subject texts than the other two groups.

## CHAPTER 5 FINAL DISCUSSION

In order to bring together the major results obtained from the statistical analysis of the data presented in Chapter 4, three tables were organized to display these results.

Table 14 presents the mean scores obtained by the experimental groups and the parts of the pre- and post-test in relation to each other, together with their total mean scores. The table also shows the difference in mean scores of the groups and the parts in the pre-test with those of the post-test. In addition, the F value obtained in the analysis of variance is included in this table because it helps the reader to visualize the results of the groups and the parts on overall performance.

TABLE 14. Mean scores of the Pre- and Post-test and the F value.

PARTS GROUPS	PRE-TEST					POST-TEST					
	1st	2nd	3rd	Total (Groups)	F (Groups)	1st	2nd	3rd	Total (Groups)	Dif.	F (Groups)
EGA	8.50	7.45	7.80	7.92		12.30	10.35	10.40	11.02	3.10	
EGB	6.05	5.83	7.33	6.41	11.80	11.61*	10.05	9.88	10.52	4.11	3.64
EGC	6.60	3.88	4.56	5.01		10.00	9.56*	8.64*	9.40	4.39**	
TOTAL (Parts)	7.05	5.57	6.38			11.19	9.95	9.56			
Dif.						4.14	4.38**	3.18			
F (Parts)		2.88					3.58				

\* = Highest difference in mean score in each part.

\*\* = Highest difference in global mean score.

• = Highest total in mean score.

Dif. = Difference between the mean score of the Pre-test with those of the Post-test.

Table 15 shows the most significant percentages obtained by each group on specific items of the questionnaires.

TABLE 15. Most scored items of the questionnaires.

		EGA (%)	EGB (%)	EGC (%)
1	Students' Academic Year: 2nd 3rd	40.0	33.3	100.0
		40.0	44.4	-
2	ESP, a compulsory subject in the course:	5.0	5.5	100.0
	necessity of ESP course within main course of study	40.0	44.4	-
	thinks it is important to know English:	30.0	33.3	-
3	reading comprehension:	90.0	94.0	96.0
4	specific bibliography: 75%	25.0	38.8	68.0
	50%	50.0	33.3	28.0

On the basis of these results the following aspects are noteworthy:

a. The results obtained from the Parts of the pre- and post-test displayed in Table 14 show that at the beginning of the treatment the groups did not respond differently to these parts of the pre-test ( $F=2.88$ ) although there were some differences in results among them. After the treatment, however, there was a significant change in performance; the groups responded differently to one or all

the parts ( $F=3.58$ ). The results in the Total of the parts and their Differences reveal that the First and the Second Parts outsourced the Third Part. This implies that there was a much stronger treatment effect on the students' scores on reading comprehension at the end of the course which enhanced the students' performance on basic grammar and vocabulary (First Part) as well as their reading comprehension of general interest texts (Second Part).

It is worth noting that the Second Part scored the lowest mean score in the pre-test while it outsourced the other two parts in the post-test. This suggests that no matter which procedure is used, whether the use of general interest texts or specific texts related to the students' subject area, both proved to be efficient to enhance the students' performance on general interest texts.

It is interesting to note that although the learning content of the instructional programme did not contain specific grammatical components such as the teaching of pronouns, verbs, demonstratives, etc., the procedure used during the treatment increased the students' performance on this Part of the test on which the students were asked to complete a cloze test with multiple choice (Appendix 4).

b. Another aspect to be considered is the performance of the experimental groups. As seen from the results in Table 14, the groups were heterogeneous ( $F=11.80$ ) at the time of the pre-test. Then there was a marked change and the groups became homogeneous in their overall performance

by the end of the instructional programme ( $F=3.64$ ).

As mentioned before, the heterogeneity of the groups in terms of language proficiency, academic year, background knowledge and subject area of study, is due to the actual situation of ESP courses at the Federal University of Paraná. EGC represents an exception due to the fact that ESP is a compulsory subject within the Food Science course. This fact makes it a more homogeneous group in terms of academic year, motivation and interests as shown in Table 15. Furthermore, the change from heterogeneous to homogeneous groups, as a whole, leads us to the assumption that there was a strong treatment effect on the groups' overall final reading comprehension performance.

c. As seen from the results in Table 14 the most proficient group in the pre-test is EGA (total=7.92) while the least proficient is EGC (total=5.01). However, when we compare the differences between the mean scores of the pre-test with the post-test we notice that EGC outscored the other two groups (4.39) and that EGA scored the lowest difference (3.10).

In view of these results, several hypotheses are plausible:

1. homogeneous groups such as EGC perform better than heterogeneous groups (EGA and EGB);

2. the most efficient procedure to enhance reading comprehension is the one in which specific texts are selected from the students' subject area of study (EGB and EGC);
3. homogeneous groups working with specific texts (EGC) perform better than heterogeneous groups working with or without specific texts (EGA and EGB);
4. certain factors, including, for example, background knowledge, may have operated on overall performance to overcome the lack of linguistic proficiency (EGC).

d. If we consider the actual ongoing situation of the Federal University with large and heterogeneous classes with students from different subject areas of study, the results obtained from a homogeneous group such as EGC, are not so significant. Thus we suggest that the results of the two other groups, EGA and EGB, be analysed in order to investigate possible meaningful learning effect over groups which consisted of students from different subject areas of study and which worked with different types of texts.

As seen from the results in the analysis of the questionnaires, Table 15, EGA and EGB scored very similarly (though not identically) in all the items. This means that these groups are different from EGC as the table indicates.

In Table 14 we notice that the most proficient group, EGA, is always followed by EGB. However, on overall

performance (i.e. Difference in mean score) EGB performed better than EGA. This is best seen in Table 16 which presents the difference in mean scores obtained between the pre-test with the post-test in each part.

TABLE 16. Difference between the groups' mean scores of the pre-test with the post-test on each Part of the test.

PARTS	GROUPS	
	EGA	EGB
1st	3.80	5.55*
2nd	2.90	4.22*
3rd	2.60*	2.55

\* Highest difference in Mean score.

As mentioned before (4.4.1.1, p.80) there is no way to know for certain why EGB outperformed EGA in the First Part. Two explanations are possible: The high SD (4.66) of EGA in the First Part of the pre-test (Table 7) proves that there is more variability from the central point in the distribution than EGB (SD=3.84). This means that this variability might have accounted for the group's poor overall performance in spite of it being the most proficient.

The fact that EGB worked with specific texts selected from each student's subject area of study may have encouraged the students to read slowly and carefully. Thus

the students' main concern on the word-level of the text rather than to its whole-text level.

In the Second Part of the test, EGA should have gained an advantage from being tested on general interest texts and EGB at a disadvantage for the same reason. However, EGB outperformed EGA in the Second Part and EGA outperformed EGB in the Third Part, which tested reading comprehension of specific texts.

In considering these results, we might argue that other factors besides learning effect may have influenced the groups' final performance. One of these factors may have been related to the students' prior knowledge of the world or their knowledge of the subject matter. According to SMITH <sup>45</sup> (p.70), "If there is to be any comprehension, it must come from the meaning that a listener or reader brings to the language being attended to". We understand that the process of comprehension involves both the text and what the reader brings to the text in the way of background knowledge. Thus in the case of EGA, where linguistic proficiency was greater, background knowledge may have been inferior.

Linguistic proficiency is another factor which may have been lacking in EGB. However, the group's background knowledge may have overcome this deficiency. It is worth mentioning the fact that EGC was the least proficient group in the experiment as is evident in Table 14. Nevertheless, it outperformed the other two groups on overall performance. This fact lends support to this argument in that the same



may have occurred to EGB in relation to EGA.

The degrees of difficulty of the texts may be another factor which might have influenced the groups' performance. As seen in Table 14, the Third Part scored the lowest mean score and the lowest difference in the post-test. It might be argued that there were texts in which linguistic proficiency sufficed without any recourse to background knowledge, or texts which required background knowledge for their comprehension.

Students' attitudes towards the texts may have been another factor to be considered. As seen from the results in the analysis of the questionnaires (Table 15), EGA and EGB scored very similarly in all items. However, it might be argued that their differences in performance might have been due to students' attitudes or interest in the texts used in the pre-test and post-test. Texts with subject matters which appealed to students' interest may have induced them to a better comprehension. 'General interest' texts might have not been of interest to some students in EGA while the texts might have caused more interest to students in EGB who had been working with texts related to their subject area.

Besides this, students may have been familiar with the texts when reading them for the second time. This may have been a motivating factor or a demotivating one.

## CONCLUSION

Before conducting this research we had in mind the problem related to large and heterogeneous ESP classes at the Federal University of Paraná, where students' main interests tended to be in matters related to their specialization. This fact and the lack of teachers to prepare specific materials led to the hypothesis drawn for this research: that the use of general interest texts would result in a better reading comprehension performance among ESP undergraduate students than two possible alternative procedures in which specific texts are used. If this hypothesis had been confirmed in all its details, group EGA would have scored higher on all statistical analysis carried out. As seen from the results, EGA, the group which worked with general interest texts, did not performed any better than the other two groups which worked with specific texts. However, in view of the results of the statistical analysis and the several aspects discussed in Chapter 5, we conclude that some points of considerable importance have emerged from the experiment which also lead to useful implications for reading comprehension: a. Students have responded favourably to the reading comprehension ESP course designed for the instructional programme. The course has proved to

have been effective and adequate for the students we had in mind; b. The procedures used during the course have proved to enhance students' grammatical performance although the methodology adopted was not aimed specifically at grammatical items. This fact raises the question of whether the inverse could have produced the same results, in other words, would a grammar-based approach enhance reading comprehension in a similar ESP context?; c. Homogeneous groups, such as EGC, perform better than heterogeneous groups (i.e. EGA and EGB), especially if specific texts related to the students' field of study are used; d. The use of general interest texts by groups like EGA enhanced reading comprehension of specific texts related to the students' subject area, while the use of specific texts by groups as with EGB and EGC enhanced reading comprehension of general interest texts.

### **Pedagogic Implications**

An effective ESP reading comprehension course should concentrate only on those elements which are essential to the learners' specific needs and aims. A well-planned course should develop reading skills which will enable the ESP students to read English texts in a relatively short period of time.

The procedures used either with general interest texts or specific texts related to the students' subject area of study are most appropriate for homogeneous groups in terms of academic year, background knowledge, interests and

motivation. However, if this is not always possible due to administrative constraints, for example, then, the most reasonable procedure might well be that in which general interest texts are used in order to suit the majority of the students and also to solve the problem of specific material preparation. Ideally, now and then, the teacher could insert more specific texts selected from broad areas of study such as Medicine, Biology, Chemistry, Physics, Engineering, etc. This procedure may satisfy students' desire for specific texts in their specialization.

It appears that large and heterogeneous classes working with the same reading selection of material makes it easier to handle and more productive for the teacher. Furthermore, it seems that when students work with specific texts related to their area of study they tend to read slowly and carefully in attempting to exploit the text at a word or sentence-level.

It is hoped that these pedagogic implication will be equally valuable to other ESP courses.

Besides the important points discussed above, we also conclude that clear-cut conclusions could not be drawn exclusively on the basis of the results obtained. This is due, mainly, because the process of reading is a complex activity and because the results obtained from the tests can be accounted for in terms of an interaction between the methodology used and other factors which emerged during the analysis of results. These factors were: the effect of students' background knowledge, the students' linguistic

proficiency and texts effects on students' attitudes and motivation.

A learning effect alone could not have explained why groups EGB and EGC performed better in all three parts of the pre-test and post-test. It is likely, then, that this was due, to a certain extent, to background knowledge effect. Similarly, linguistic proficiency might have operated in some of the students' final reading scores. It is not easy, however, to see how such effects could be controlled within this type of research. Thus, further research could be carried out aiming at investigating the effect of students' background knowledge of a particular academic area on their comprehension of written texts.

Recomendations are also made with regard to the need for further research concerning the reading process and the strategies students employ during their reading activity. Furthermore, in order to try to explain these strategies and to produce appropriate reading comprehension tests, further research into the process of test procedures is necessary.

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APPENDIX 1  
QUESTIONNAIRE

## UNIVERSIDADE FEDERAL DO PARANÁ

## QUESTIONÁRIO

O objetivo deste questionário é obter dados para a realização de uma pesquisa que tem objetivo puramente acadêmico. Contamos com a sua colaboração sincera no preenchimento do mesmo.

**i dados pessoais**

1. Nome:
2. Endereço:
3. Telefone:
4. Curso:
5. Período ou Ano:

**ii motivação para o inglês instrumental**

(Assinale com um X a alternativa que se refere a você. Faça uma só escolha.)

Você está inscrito neste curso de Língua Inglesa Instrumental porque:

- a. ☐ é uma disciplina obrigatória dentro do seu curso.
- b. ☐ precisa completar a carga horária.
- c. ☐ sente a necessidade desta disciplina para o curso que realiza.
- d. ☐ pretende viajar.
- e. ☐ necessita desta disciplina para realizar curso de especialização, mestrado, doutorado ou curso no exterior.
- f. ☐ gosta de inglês.
- g. ☐ acha necessário saber inglês para ampliar seus conhecimentos.
- h. ☐ outro motivo. Qual? \_\_\_\_\_

**iii interesse no curso**

- 1 Você se matriculou no Curso de Língua Inglesa Instrumental esperando que este o capacite a:

- a. ☐ compreender textos.
- b. ☐ entender a fala.
- c. ☐ redigir.

- 2 Do total de textos que serão estudados durante o curso, quantos você gostaria que fossem selecionados da bibliografia técnico-científica de sua área de estudos?

- a. ☐ 100% do total de textos.
- b. ☐ 75% do total de textos.
- c. ☐ 50% do total de textos.
- d. ☐ 25% do total de textos.
- e. ☐ 0% do total de textos.

**iv assuntos**

Quais os assuntos específicos que mais lhe interessam dentro de sua área de estudos? Cite 3.

- 1.
- 2.
- 3.

APPENDIX 2  
COMMON CORE

UNIVERSIDADE FEDERAL DO PARANÁ - SCHLA - DELEM

LÍNGUA INGLESA INSTRUMENTAL I

from

READING AND THINKING IN ENGLISH\*

Concepts in Use

Exploring Functions

Nome: \_\_\_\_\_

Curso: \_\_\_\_\_

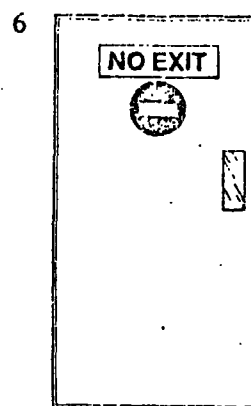
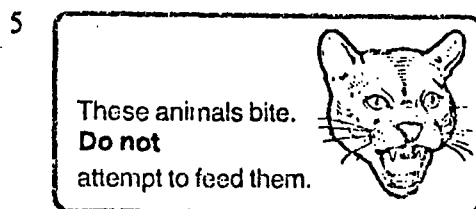
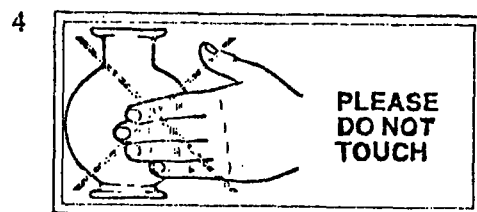
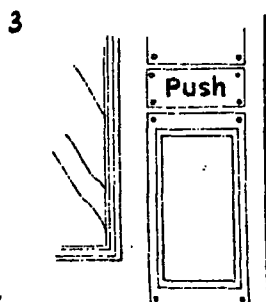
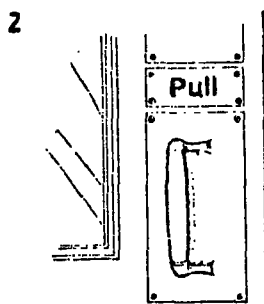
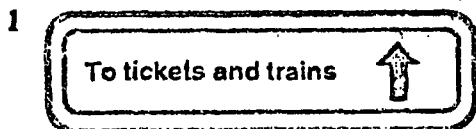
\*We would like to thank Ms. Allison McGowan, the Oxford University Press representative in Brazil (in 1983) for permission to photocopy and experiment with the materials from the Reading and Thinking series.

AIM : To show how grammar is used to express different communicative functions.

PART 1     Sentences in Use

Look at these notices. Then answer the questions.

- Which of these notices would you see
- in a house
  - in a public building
  - in a railway station
  - in a zoo
  - in a museum
  - in a cinema
  - in a street
  - in a petrol station?

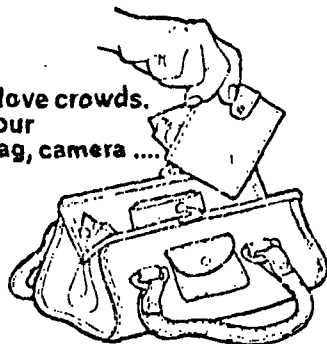


Notices have different purposes. Numbers 2,3,8,9 help you by giving information. What information does number 9 give ?

Numbers 5,7 and 12 give warnings. Something bad will happen if you don't follow them. What will happen if you don't follow them ?

7

Thieves love crowds.  
Watch your  
wallet, bag, camera ....



8

ENTRANCE →

9



12

This liquid is  
inflammable  
**DO NOT SMOKE**

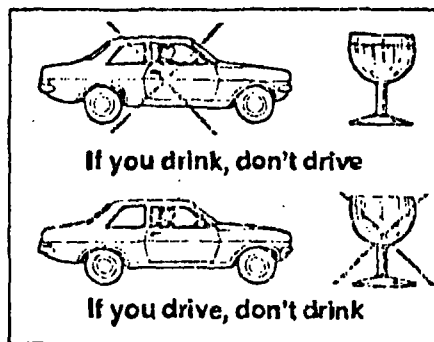


13

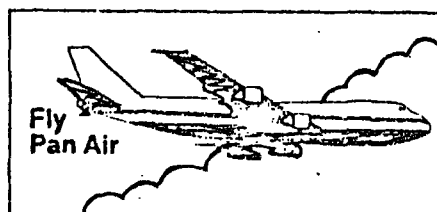
Police Notice

**STOP**

10



11



Numbers 4, 6 and 13 give orders. Number 4 orders you not to .....  
Number 6 orders you not to ..... What does number 13 order you  
to do ?

Numbers 10 and 11 are trying to persuade you to do something. What  
does number 11 try to persuade you to do ? Number 10 means you must  
not ..... and ..... at the same time.

## PART 2    Forms of Sentences

Study the following sentences. Underline the verb in each sentence.

Watch your wallet.

Don't attempt to feed the animals.

Dial 999.

Stop.

Fly Pan Air.

Do not touch.

All the above sentences are imperative sentences.

Which of the following are imperative sentences ?

Do not speak to the driver.

This liquid is inflammable.

Please keep windows closed.

Thieves love crowds.

People in crowds do not watch their wallets.

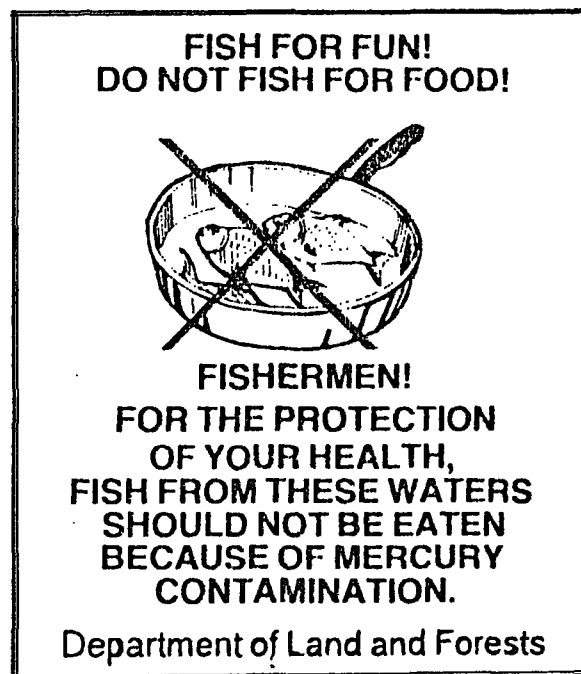
Buy Sabor Coffee and win a holiday in Brazil.

#### SUMMARY

Sentences in Use identified the purpose of the sentences.

Forms of Sentences identified the grammatical form of the sentences.

Activity 1. Read the following notice:



Now answer these questions:

- 1 Is the function of the notice to give information, to warn or to give an order?
- 2 Where would people see the notice?
- 3 Can people fish where they see the notice?
- 4 What must they not do?
- 5 What warning is given by the picture?
- 6 What will happen if people do not follow the warning?
- 7 Write this warning in the form of an imperative sentence:

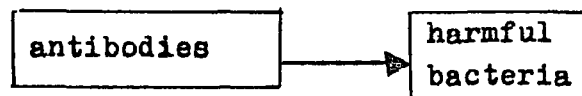
*Fish from these waters should not be eaten.*



PART III Grammar and Information

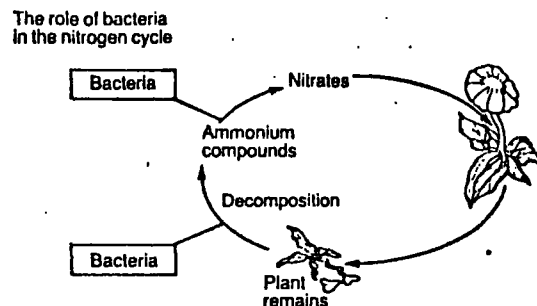
AIM : To show how the same meaning can be expressed in different ways by means of different grammar and vocabulary.

Activity 2. The same information can be expressed in different ways.



1. Antibodies attack harmful bacteria.
2. Harmful bacteria are attacked by antibodies.

Now study the following diagram and complete the sentences about it.



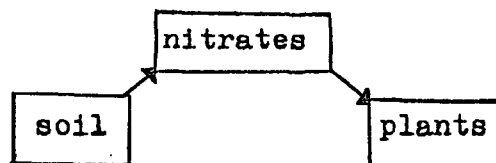
1. Plants absorb .....
2. .... decompose plant remains.
3. Decomposition releases .....
4. Bacteria convert ..... into nitrates.

Statements 1 - 4 refer to the action of plants, bacteria and decomposition. Now complete the following statements to give the same information in a different way.

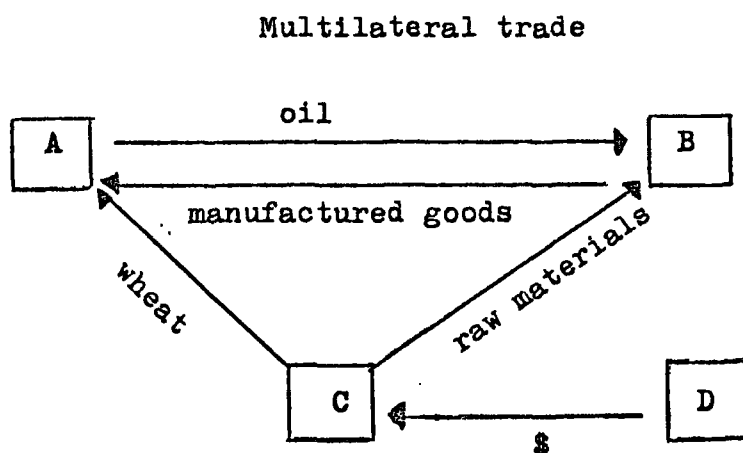
5. .... are absorbed by plants.
6. Plant remains are decomposed by .....
7. .. are released by .....
8. .... are converted by ..... into nitrates.

Activity 3. Different vocabulary and grammar can express the same information. Study this example :

1. The soil provides nitrates for plants.
2. Plants obtain nitrates from the soil.



Now study the following diagram and complete the statements about multilateral trade.



1. A exports oil to .....
2. B sends ..... to .....
3. .... sells raw material to .....
4. .... lends money to .....
5. C ..... to A.

Now complete the following statements to give the same information. The order of the information in statements 6 - 10 is different from the order in statements 1- 5.

6. .... imports ..... from A.
7. .... receives ..... from .....
8. B ..... from .....
9. .... borrows ..... from .....
10. A ..... from C .

## UNIT II

## SYSTEMS

AIM : To develop students' ability to understand simple passages containing : lists of members, lists of parts.

PART I                      The Solar System

The solar system consists of a star (the sun), the planets and a number of other bodies, such as satellites and asteroids. The sun is the centre of the solar system. The planets revolve around it. There are nine planets in all. They are as follows : Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto. Some planets have satellites. The Earth has one satellite. It is called the Moon.

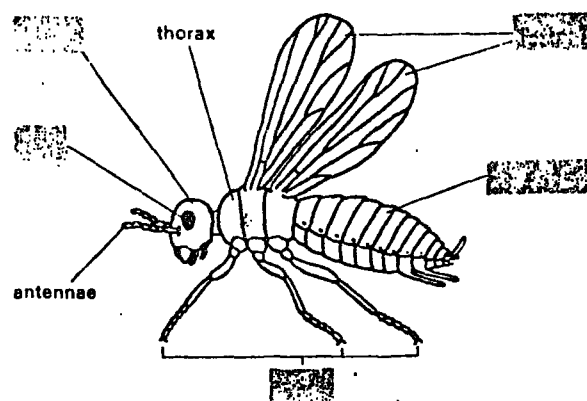
Table 1. Complete :

System	Parts

PART II                      Insect Anatomy

The body of an insect consists of three main parts : the head, the thorax and the abdomen. The head contains the insect's brain, eyes and mouth. It also carries the antennae. The thorax is the central part of the body. It bears the legs and wings. There are three pairs of legs and two pairs of wings. The insect's abdomen contains its digestive and reproductive organs.

Activity 1 : Label the diagram :



PART III The Skull and Vertebrae

The internal skeleton of man consists of more than two hundred bones. It is divided into three main parts : the skull, the spinal column (which supports the head and is the main axis of the body) and the limbs.

The skull is made up of eight cranial bones and fourteen facial bones which are all fused together. It is connected to the lower jaw by a movable joint. The skull turns freely on top of the vertebral column which is made up of separate bones called vertebrae. The vertebrae interlock to form a strong flexible column through which the spinal cord runs. Each vertebra consists of a short bone and a ring which encloses the spinal cord. Each vertebra is separated from the others by a disc of cartilage.

Complete the following table with information from the passage :

Table

Whole	Parts
	more than 200 bones
skull	
	vertebrae
vertebra	
skeleton	1. 2. 3.

Summary The different ways of expressing structure are :

a. Whole Parts

The skeleton	Consists of	the skull, the spinal column and the limbs.
	Contains	
	is divided into	
	is made up of	

b. Parts Whole

The skull, the spinal column and the limbs	Make up	the skeleton
	Form	

AIM : To give practice in ways of expressing :  
 dimensions (diameter, length, height, width, depth ),  
 property ( temperature, colour, size, shape ) and  
 passages which list and enumerate properties.

### PART I Snakes

There are thirteen families of snakes. They all have a number of important characteristics. Firstly, their body is thin and cylindrical and has no separate tail. Secondly, the body is covered with hard, smooth scales. Thirdly, there are no external limbs. Snakes have small circular eyes, a thin tongue and small pointed teeth.

Table :

System	Characteristics	
	body	
	tongue	thin
	teeth	
	limbs	
Important Characteristics of Snakes		
1.	..... body with no .....	
2.	.....scales.	
3.	.....	

### PART II The Human Circulatory System

The human circulatory system consists of the heart, the blood vessels and blood. Blood is a thick red fluid. There are about 6 pints of blood in the average human body.

There are three types of blood vessels : arteries, veins and capillaries. Arteries are large tubes. They carry blood to all parts of the body. Arterial blood is bright red and contains oxygen. Capillaries are tiny vessels. Veins are narrow tubes. They have thin walls and are inelastic.

The heart is a cone-shaped organ. It is located in the centre of the chest. It is a thick, muscular organ and has four chambers. The average heart is about 13 cm long, 9 cm wide and 6 cm thick. It weighs about 300 g.

Table :

Type of blood Vessel	Characteristics
1.	
2.	
3. veins	

Organ	Size	Shape	Number of chambers	Weight
the heart				

PART IIIDimensions

The length of the Nile is 6690 kilometres.

= The Nile has a length of 6690 kilometres.

= The Nile is 6690 kilometres long.

Activity 1 Use information in the table to complete the statements :

	Length	Width	Height	Depth
The Nile	6690 km			
The Straits of Gibraltar		20 km		
The St. Gothard Tunnel	14 km			
Vesuvius			1277 m	
The Newton Crater on the moon				14000 ft
The Pacific Ocean				maximum 36 198ft
Fujiyama			4132 m	
The Amazon	6900 km			

1. The St. Gothard tunnel ..... length of .....
2. .... is 20 km.
3. The Pacific Ocean ..... 36 198 ft.
4. The ..... of Fujiyama is .....
5. The Amazon is 6900 km .....
6. The Straits of Gibraltar ..... wide.
7. .... 1277 m high.
8. The Newton Crater ..... deep.

## UNIT IV

## STRUCTURES

**AIMS :** To give practice in ways of expressing location and spatial relations.

To show how relations between parts that make up a system are expressed (connections, directions and enclosures).

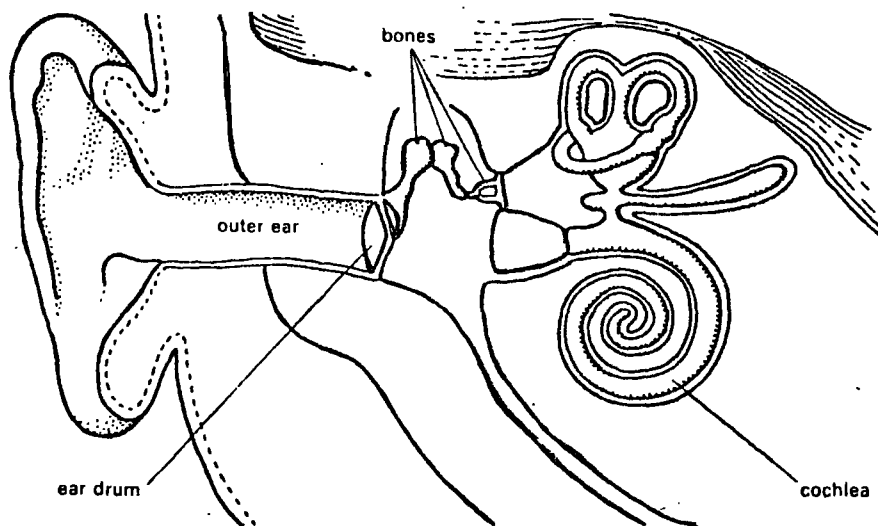
To give practice in ways of comparing members of a system.

PART I      The Ear

Man has two ears. Each ear has four main parts :

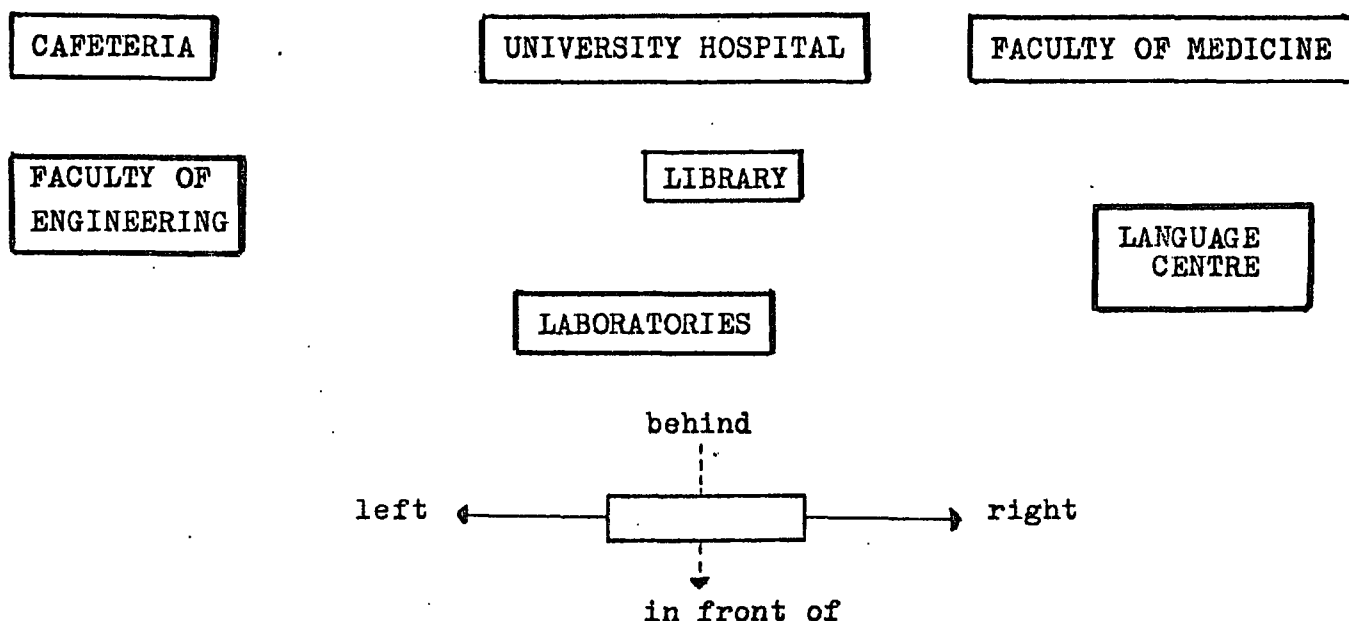
1. The lobule is outside the skull.
2. The outer ear contains the eardrum, a thin membrane of skin. Sound waves enter the ear and produce vibrations in the eardrum.
3. The middle ear is next to the outer ear. It contains three bones which transmit sound waves to the inner ear.
4. The inner ear is next to the middle ear. It contains the cochlea. Inside the cochlea is the corti, the organ of hearing.

**Activity 1**      Read the passage and complete the table :



**Table :**

System	Main Parts	Other Parts	Location
		1 2	

PART IIA University Campus

Activity 2 : Use the map to complete the statements :

- ..... is located between the laboratories and the hospital.
- The hospital ..... between the ..... and the .....
- The Faculty of Medicine ..... to the right of the hospital.
- ..... is situated to the left of the library.
- The hospital ..... behind the library.
- The laboratories are ..... in front of .....
- The Faculty of Engineering ..... the cafeteria.

PART IIIComparing members of a SystemPlants

All flowering plants are composed of four organs - roots, stems, leaves and flowers. The central part of the plant is the stem. The roots are attached to the bottom of the stem and usually grow underground. Some plants have one single root, others have many small roots. The leaves are connected to the sides of the stem. Some leaves are long and thin, others are fat and round. Some leaves are single, others are compound. The flower is attached to the top of the stem. Flowers contain the plant's reproductive organs. Most plants have the male and female organs in the same flower. Some plants have separate male and female flowers.

Activity 3 : Read the passage and complete the table :

organ	characteristics	differences



PART IVThe Eye and the Camera

Study the following table and identify:

- a. The characteristics which the eye and the camera have in common.
- b. The characteristics which make them different.

Characteristics	Eye	Camera
Needs light rays to function	✓	✓
Has a lens	✓	✓
Has a sensitive surface	✓	✓
Lens moves backwards and forwards	✗	✓
Curvature of the lens changes	✓	✗
A device regulates the amount of light that enters	✓	✓

Next read these statements which compare the eye and the camera; answer the questions and complete the tables :

The camera and the eye are similar in many respects. They both need light rays in order to function. Both have a sensitive surface on which the image is formed. In the eye the image is formed on the retina. In the camera the image is formed on the film. As in a camera, the image on the retina is inverted.

Both the eye and the camera have a lens. The lens focuses the image on the sensitive surface. In the camera, the lens moves backwards and forwards. In the eye the curvature of the lens is changed. In this respect the eye differs from the camera.

Both the camera and the eye have a device to regulate the amount of light that passes through the lens. In the camera there is a shutter of variable speed and a diaphragm of variable aperture. In the eye the iris automatically adjusts the size of the pupil according to the intensity of light.

Both the eye and the camera are sensitive to light, shade and colour. The film records light, shade and colour. The eye perceives them but does not record them. The two eyes together produce a three-dimensional image. The camera lens produces a two-dimensional image.

The eye is more flexible than the camera. It can adapt more quickly to a wider range of light conditions. Both the camera and the eye can register small objects and distant objects. The camera performs these functions better than the eye.

- a. What is the eye's sensitive surface called?
- b. What devices in the eye and the camera regulate the amount of light that enters?

- c. What advantages do the eyes have over the camera ?
- d. What advantages does the camera have over the eye?

Table 1 :

Characteristics	Eye	Camera
The image is inverted		
The lens focuses the image		
Sensitive to light, shade and colour		
Records light, shade and colour		
Produces three-dimensional image		

Complete the following statements showing similarities and differences between the eye and the camera :

Table 2 : Similarities

How they work	They cannot function without .....  They have a ..... to form the ...
What they are able to do	Both can .....

Table 3 : Differences

How they work	In the eye the image is formed on the .....  In the ..... the image is formed on a .....
What they are able to do	The eye ..... light, shade and colour. The ..... cannot record ..... The ..... is able to .....

## UNIT V

## SYSTEMS IN ACTION

**AIMS :** To show ways of expressing function and characteristic behaviour of systems and their parts, particularly involving changes of state, giving and receiving.  
To show ways of expressing ability (or capacity) and necessity.

PART IA Computer System

A computer system is made up of a number of inter-connected systems. The heart of the computer is the central processor (c.p.). An input device converts information into electronic pulses and passes the programme and the data into the c.p.

The c.p. performs the necessary calculations and controls the input and output units. The c.p. is divided into 3 parts. The memory unit stores the data and the programme. The control unit selects data and instructions from the memory unit, interprets them and controls the calculations. The arithmetic unit adds, subtracts and compares data. The output device converts electronic pulses back into information and presents the information to the user.

Table 1 : Complete the table :

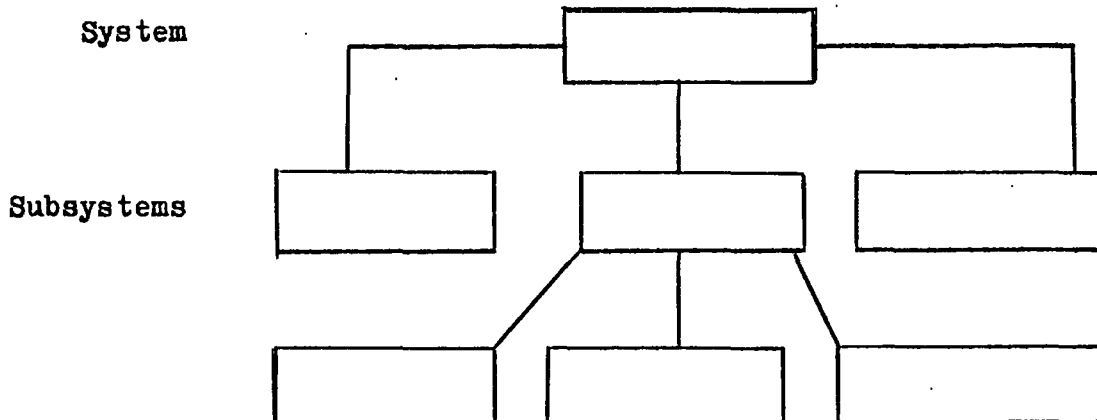


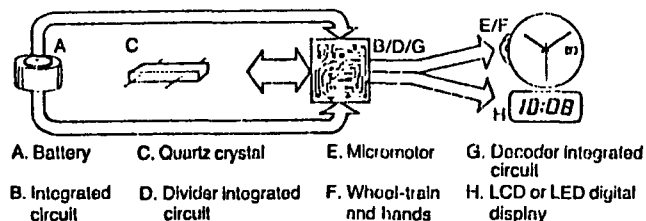
Table 2 : Complete the table :

Subsystem/Unit	Function
1.	
2.	
3.	
4.	
5.	
6.	

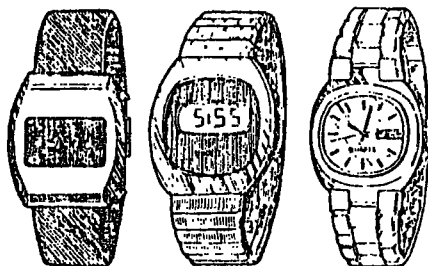
**PART II**

How many types of electronic watches are there?

Electronic watches are based on the technology used in small calculators. They consist essentially of a quartz crystal and a tiny integrated circuit.



An electronic current from a battery makes the quartz crystal vibrate. The integrated circuit contains hundreds of electronic components. It turns the vibrations into a pulse for every second. Then it stores the seconds to make minutes, hours and days.



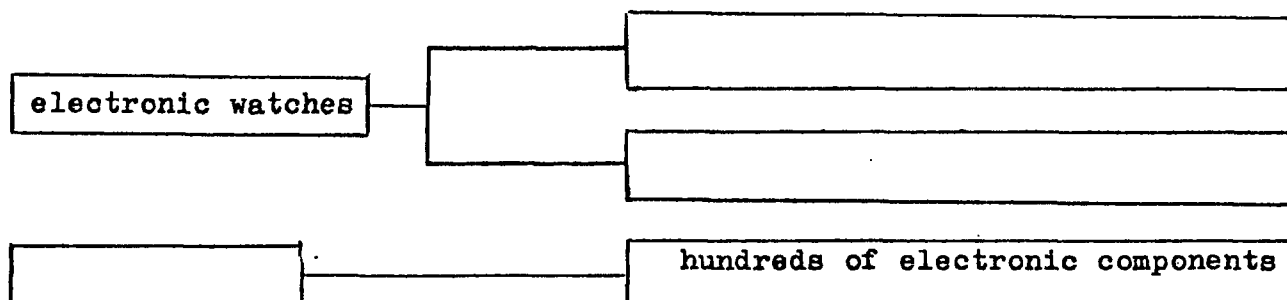
Electronic watches have three ways of showing the time. Some watches have LEDs (light emitting diodes) which appear as small red figures. These figures light up only when a button is pressed.

Other watches have an LCD (liquid crystal display) which is continuously on.

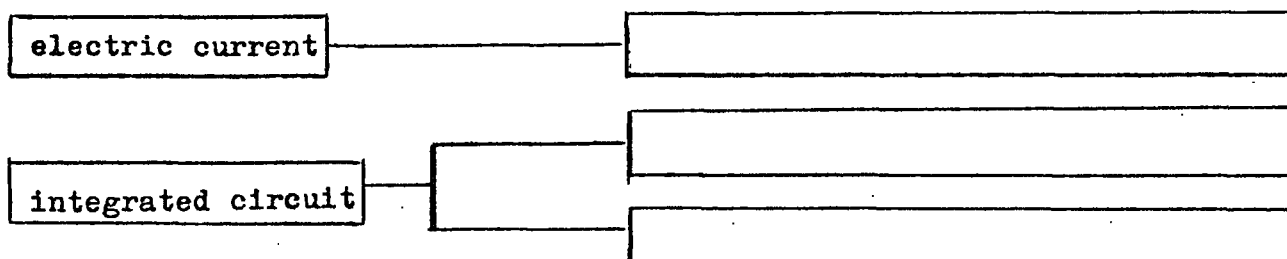
Other electronic watches have ordinary watch faces and hands. The quartz crystal controls a tiny motor that moves the hands. These watches are called analogue watches.

Activity 1 : Complete the following diagrams :

### Structure



### Function



LED

makes the figures appear

Analogue

quartz crystal




### PART III

### Capacity and Necessity

#### Adaptation

All living things must adapt to their environment. Some organisms are able to look for suitable environments. Some organisms have to change in order to suit their environment.

Some organisms are able to utilize food in their immediate surroundings. Other organisms have to move in order to find food. A plant cannot move but it can obtain food from its immediate surroundings. Its leaves and roots enable it to obtain food from the atmosphere and the soil. Birds travel long distances to obtain food. Their beaks are adapted to catching insects, fish or other food.

A fish's respiratory organs are adapted to life in the water. It takes in dissolved oxygen from the water. Its organs are not suitable for absorbing oxygen from the air. The lungs of a man are adapted to breathing air. They do not function in water.

Activity 2 : Now complete the tables :

	Parts	Function	How they obtain food	
Plants	leaves .....	enable plants to		
Birds		enable .....to	travel long distances	
	Parts	Function	Suitable Environment	Unsuitable Environment
Man		enable man to	air	
Fish	respiratory organs	enable fish to		

AIM : To develop student's ability to understand simple descriptions of processes containing temporal and causal relations.

### PART I      The Life History of a Plant

First, a seed germinates in warm damp soil. In germination, a root and a shoot grow out of the seed. At the same time, the remains of the seed decay. Then a young plant grows and leaves are formed. When the plant matures, flowers are formed. The flowers are pollinated by wind, insects or water and then fruits are formed. After that, the flowers die. The fruits remain and the seeds from these fruits grow into plants during the following season. Before that the old plant decays. Decaying plants enrich the soil with chemicals. These chemicals provide food for other plants.

Summary
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7

Now, complete the table with words from the list :

Maturity

Growth

Decay

Formation

Germination

Pollination

### PART II      An Example of Biological Feedback : Taking a Glass of Water

The action of taking a glass of water requires a series of muscular actions. The memory contains a record of the necessary sequences. Consequently, the brain can send the necessary control signals through the nervous system. The control signals stimulate the arm muscles. As a result, the muscles move the arm in the necessary direction.

The hand approaches the glass. At the same time, the eye observes the progress of the hand. The eye sends information about the hand's progress to the brain. This information is compared with the memory's record of the action. Decision elements in the brain can send signals to correct any errors. Consequently, the muscular actions will change. These operations are repeated in many cycles. Finally, the glass is reached.

Activity 1 : Complete these stages :

Stage 1    The brain sends .....

Stage 5 .....

Stage 2    ..... the arm muscles.

Stage 6 .....

Stage 3    The arm .....

Stage 7 .....

Stage 4    .....

Stage 8 .....

PART III Expressing Cause and Effect

Study the following passage and identify : a. the problem, b. the solution which has been adopted.

At 3.45 p.m. on August 6<sup>th</sup> 1976 Big Ben stopped working.

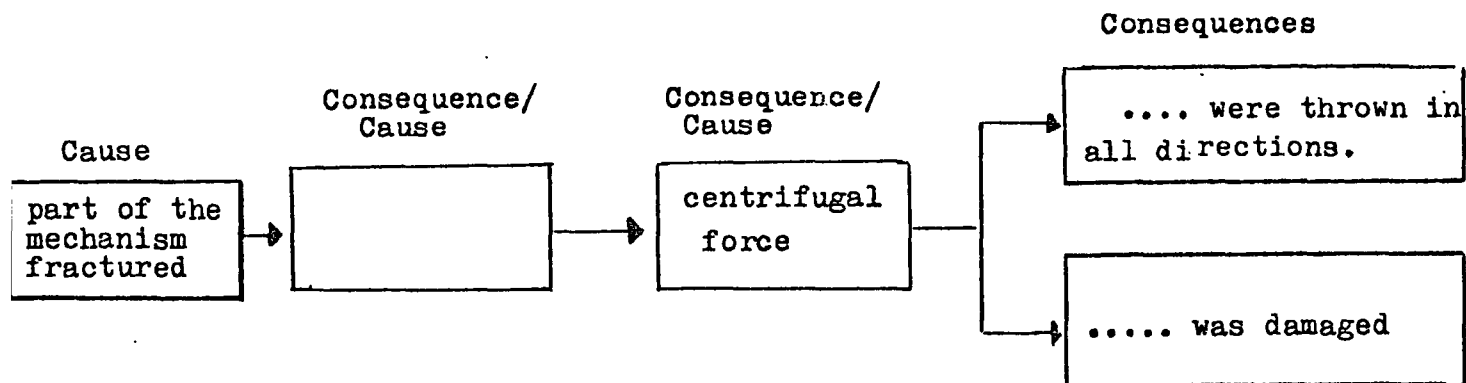
The engineers who repaired the clock believe that the breakdown was the result of metal fatigue. Metals deteriorate owing to repeated stresses above a certain critical value.

Part of the clock mechanism fractured. As a result, the speed of the gear wheels increased from about  $1\frac{1}{2}$  revolutions per minute to 16 000 rpm. The resulting centrifugal force threw pieces of the clock mechanism in all directions. It also damaged the mechanism which drives the clock's hands.

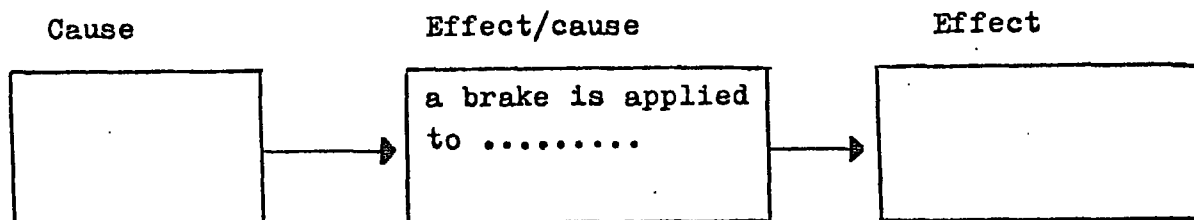
The metal fatigue had never been noticed, as fatigue cracks are invisible to the naked eye. The engineers have now fitted a device that will prevent the accident from happening again. Any increase in speed will cause a brake to be applied to the gear wheel. The engineers are confident that Big Ben will remain accurate and reliable for another 200 years.

Now answer these questions :

1. According to the engineers, what caused the clock to break down ?
2. What general statement explains the occurrence of metal fatigue ?
3. Why had the fatigue cracks never been noticed ?
4. Complete the following diagram by studying the illustration of what happened :



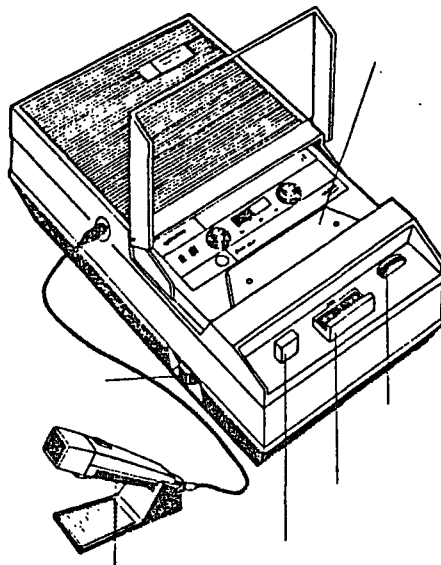
5. Complete the following diagram about the device which has been fitted.



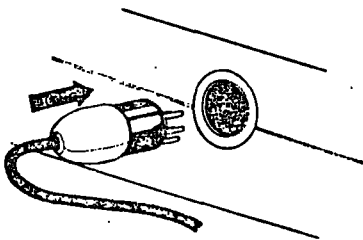
AIM : To give practice in the use of expressions of purpose and method in giving instructions.

PART I      Operating a Tape Recorder

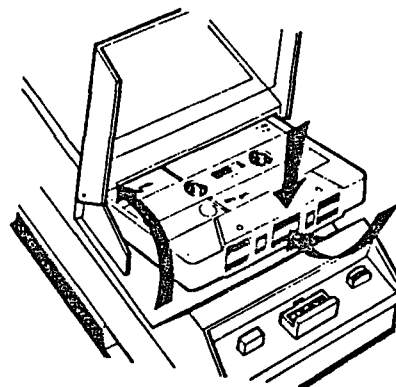
Here is a cassette tape recorder. Read the operating instructions and label the parts of the recorder indicated.



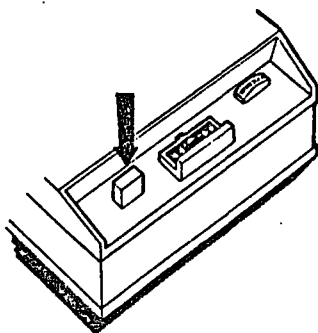
MAKING A RECORDING



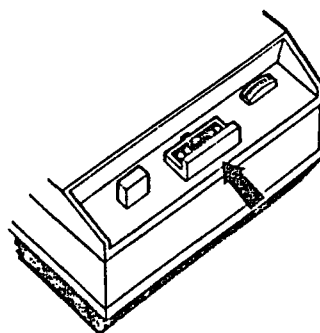
Connect the microphone



Insert a cassette in the cassette compartment

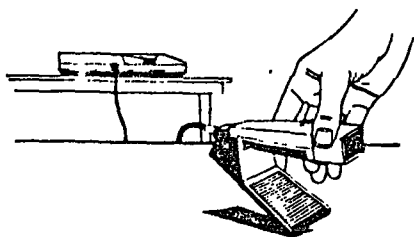


Depress the record button

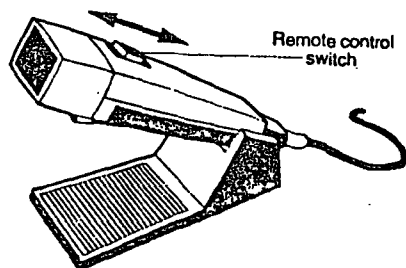


Push the control switch towards the cassette compartment. The tape will start moving.

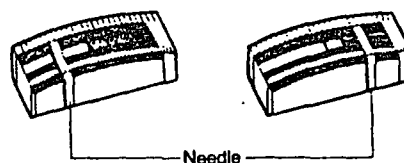




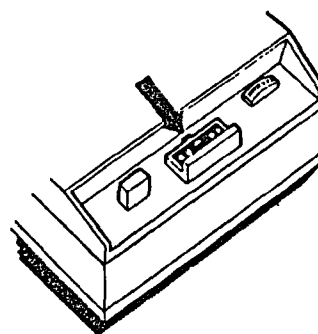
Place the microphone on a table. Do not put it on the same table as the recorder. Do not move the microphone during a recording.



The microphone is equipped with a remote control. To stop the tape, move the switch forwards. To start, move the switch backwards.



Adjust the recording level by means of the recording level control. The needle of the recording level indicator must stay in the white area. Do not allow the needle to reach the coloured area.



In order to stop the tape at the end of a recording, pull back the control.

The above sentences give instructions. Complete this sentence :

The instructions tell you how to .....

Activity 1 : Now read the operating instructions again and answer these questions :

1. What is the purpose of pushing the control switch towards the cassette compartment ?
2. What is the purpose of moving the control switch back ?
3. How do you start the tape with the remote control ?
4. How do you stop the tape with the remote control ?
5. What part of the machine is used to adjust the recording level ?
6. What must you not do when making a recording ?

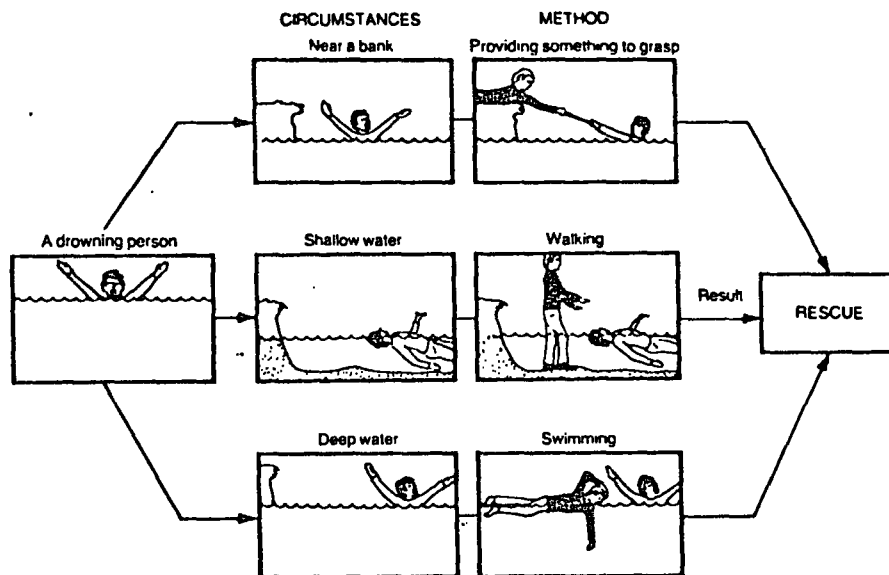
Summary : A set of instructions includes a list of actions. For example :

connect the microphone

insert a cassette

depress the recording button

adjust the recording level

**RESCUING A PERSON WHO IS NEAR A BANK**

The rescuer does not need to be a swimmer or have any special training. The best method is to give the person something to grasp. From a low bank a drowning person can be saved simply by extending a hand or a foot. If the drowning person is too far away, one end of a sweater or cord may be extended.

**RESCUING A PERSON WHO IS IN SHALLOW WATER**

In shallow water the rescuer can walk as far as necessary to reach the drowning person. He must be careful not to get into deep water. There is a very important principle in rescuing with the hand. The rescuer should always grasp the victim and not allow the victim to grasp him.

**RESCUING A PERSON WHO IS IN DEEP WATER**

A person in deep water can only be rescued by a skilled swimmer. The lifesaver has to grasp the victim and pull him to safety. The simplest method is by swimming on one's side. The rescuer pulls the victim by the hair.

**Activity 2 : Complete the following table :**

		Appropriate method
Circumstances from a low bank	the victim is .....	
	the victim is far off	
in .....water		
in ..... water		

AIM : To give practice in ways of expressing past time, sequence and chronological order.

### PART I      The Earth Before Man

For about 4000 years there was no life on earth. Primitive organic structures (such as bacteria and algae) appeared in the sea more than 3500 million years ago. The age of fish began in the mid Palaeozoic era, about 400 million years ago.

The Devonian period was a time of great topographical change. Mountains were formed. The oceans moved. This movement exposed mud, which was rich in organic materials. Vegetation grew and then the first insects appeared. After insects developed, amphibians appeared.

Reptiles developed during the carboniferous period and became the dominant form of life. Some reptiles evolved into primitive birds, others into early mammals. At the end of the Mesozoic era the surface of the earth broke up into separate land masses and many reptiles disappeared. The first men appeared about 600 000 years ago.

Activity 1 : Read the passage and complete the table :

TIME	EVENT
over 3500 million years ago	Appearance of ..... and .....
..... ago	Beginning of the age of .....
Devonian .....	1. formation of ..... 2. movement of ..... 3. growth of ..... 4. appearance of ... and ..
.....	Development of reptiles. Evolution into ..... and ....
..... of the Mesozoic era	Breaking up of ..... Disappearance of reptiles.
.....	Appearance of man

#### Language Study

Man appeared in the Cenozoic era.

= Man appeared during the Cenozoic era.

He lived there from 1840 to 1850.

= He lived there for 10 years.

Reptiles developed. Birds appeared.

= Reptiles developed. Then birds appeared.

= Reptiles developed. Next, birds appeared.

= Reptiles developed. After that, birds appeared.

Activity 2 : Use the tables to complete the paragraphs :

Table 1

## THE VIKINGS

800			
850			
870	arrival in Iceland		discovery and colonization of many lands
900			
928	landing in Greenland		trade with China
930	foundation of the Republic of Iceland		travel to many countries
950	discovery of North America		
1000	colonization of North America		
1100	disappearance from North America		

The Vikings from Scandinavia were great explorers. During the ninth and ..... centuries they discovered and colonized ..... For ..... hundred years they travelled to ..... and traded ..... They arrived in Iceland in ..... and in 928 they landed ..... In ..... the Republic ..... was founded. Between 950 and 1000 they ..... North America. From ..... to ..... they ..... North America. At the beginning of the ..... century they ..... from North America.

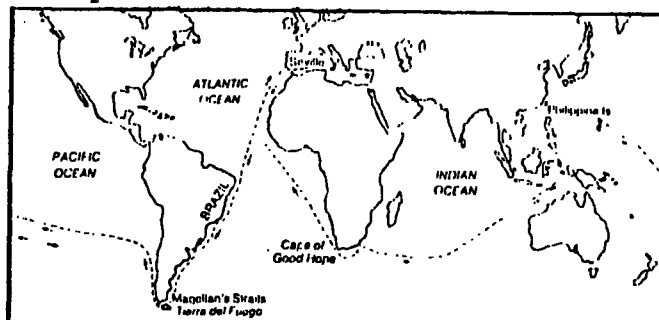
Table 2

19 <sup>th</sup> century	Discovery by Maxwell of electromagnetic waves. First generation of electromagnetic waves by Hertz.
1895	Demonstration of a system of wireless communication by Marconi.
1899	Transmission of a radio signal from England to France.
1901 December 12	Transmission of a radio signal across the Atlantic.

..... the nineteenth century Maxwell .....electromagnetic waves. ....were first generated by .....  
..... demonstrated a system of .....  
In 1899 Marconi transmitted ..... On  
December 12 ..... Marconi .....

## PART II      Expressing Past Time

The passage is about an explorer of the 16<sup>th</sup> century. This map shows where he went. Read the passage and answer these questions : a. What was the achievement of Magellan ? b. What was the achievement of the men who returned to Spain ?



Early in the 16th century men were trying to reach Asia by travelling west from Europe. In order to find Asia they had to find a way past South America. The man who eventually found the way from the Atlantic Ocean to the Pacific was Ferdinand Magellan.

Magellan sailed from Seville in August 1519 with five ships and about 280 men. Fourteen months later, after spending the severe winter on the coast of Patagonia, he discovered the channel which is now called Magellan's Straits. In November 1520, after many months of dangers from rocks and storms, the three remaining ships entered the ocean on the other side of South America.

They then continued, hoping to reach Asia. But they did not see any land until they reached the islands off the coast of Asia. Before they arrived at these islands, later known as the Philippines, men were dying of starvation. While they were staying in the Philippines, Magellan was killed in battle. The remaining officers then had to get back to Spain. They decided to sail round Africa. After many difficulties, one ship with eighteen men sailed into Seville three years after leaving. They were all that remained of Magellan's expedition. However, their achievement was great. They were the first men to sail round the world.

**Activity 3 :** What events happened in the following places?

Seville

The coast of Patagonia

The Philippines

**Activity 4 :** Number the following events to show their chronological order :

- a. the discovery of the Straits
- b. the return to Seville
- c. the arrival in the Philippines
- d. the journey round Africa
- e. the departure from Seville
- f. the stay in Patagonia
- g. the arrival in the Pacific Ocean
- h. the death of Magellan

APPENDIX 3  
SAMPLE OF TEXTS AND EXERCISES

## PROJETO NACIONAL ENSINO DE INGLÊS INSTRUMENTAL EM UNIVERSIDADES BRASILEIRAS

## GENERAL COMPREHENSION

Leia rapidamente os seguintes recortes e decida qual o título que melhor corresponde a cada um.

1. HEADACHE is one of the most common complaints of 20th century man. Since headache is an almost universal complaint, it is a topic that almost everyone can discuss from painful, first-hand experience.

Headache, it should be quickly recognized, is not a disease by itself, but rather a symptom of a disease or a functional disturbance. The causes of many headaches are relatively simple to discover; others may tax the collective brains of topnotch specialists. Thanks to recent research, the diagnosis of headache has become more exact and its treatment more certain than ever before.

Today's Health Guide, 1965.

3. An obscure tropical plant—the winged bean—has the potential to become a major protein-producing crop in areas of the world where protein is desperately needed. So states a report recently issued by the National Research Council, a scientific advisory group to the federal government.

Almost identical to the nutritious soybean, the winged bean's seed averages 34 percent protein and 17 percent oil. Its foliage is used both as a leafy vegetable and a healthful animal feed, and the 20 percent protein content of its slightly sweet-tasting roots far surpasses the two percent of potatoes and other root crops. The plant now grows abundantly in Southeast Asia, but the rest of the world seems unaware of it, the Research Council report states. It should be possible to grow the bean in protein-hungry areas in Central and South America, Africa, the Caribbean and West Asia. The soybean has not adapted well in these regions.

Popular Mechanics, Nov., 1975

6. The leading U.S. sponsor of the warning, microbiologist Stuart Levy of Tufts University, said that "while certain countries have regulations against the sale of these drugs without a prescription and against the inclusion of more than one drug in a single product, others, mainly developing nations, do not." Poor control in one country affects everyone, he said, because drug-resistant organisms "do not know national boundaries." Levy concluded, "Unless steps are taken to curtail the present situation, we may find a time when [antibiotics] are no longer useful to combat disease." Science, vol 213,

2. Though plants may respond to an occasional kind word, as some gardening enthusiasts claim, they do not like excessive noise. This was recently determined by researchers at Drexel University, Philadelphia, in an experiment with 12 coleuses, in popular house plants that have broad, multicolored leaves. After the plants had achieved normal growth characteristics in an environmental chamber, they were subjected to 100 decibels of noise, the level of noise heard in a busy subway station. Within six days, the researchers reported, the plants' growth rates had dropped an average of 47 percent. The scientists say that the continuous noise caused a severe water loss through the leaves, stems and other above-ground parts.

Popular Mechanics, Nov., 1975.

4. There is a large variety of vegetable fibers in Brazil. This makes the production of several articles possible, such as handbags, hats, all kinds of baskets, mats, fans, sandals and the like — and many others used as decorative elements. It is a typical rural area handicraft, normally complementary to the agricultural activities in all Brazilian regions. This kind of handicrafts is also somehow connected to the Brazilian Indian material culture, which excelled in the activities of basketry and weaving, producing utilitarian and decorative objects.

PRDA - MTO - 1980

5. NEW YORK — The number of babies born in the United States with some physical or mental defect has doubled since the late 1950s, a published report says.

Researchers at the University of California have concluded about 140,000 babies born this year will suffer physical abnormalities, mental retardation or learning problems while 25 years ago the number was about 70,000. The New York Times said in Monday's editions.

The paper quoted Dr. Peter Budetti, director of the Health Policy Program at the university, as estimating about 2 percent of babies born in the late 1950s had some physical, mental or learning defect. Today, Budetti said, about 4 percent of the newborns have one or more of those problems.

The study said possible cause of the increase include cigarette smoking by women, increased exposure to toxins at work and medical advances that permit people with disabilities to survive and pass the trait on.

Brazil Herald, July 19, 1983

**Brazilian Handicraft**

b Protein from tropical bean

c Antibiotics Misused

d Speak softly to your plants

e HEADACHES

f A heated seat

g Doubled Number of Birth Defects

## More Than Just Child's Play

It all started when Andreas Papadakis began looking for a doll's house for his daughter, Alexandra. He searched all over London, but everything he found was either poorly made or too conventional for his tastes. So Papadakis, who is the editor of the British magazine *Architectural Design*, tried a different approach: he launched a worldwide doll's house competition. From the 260 entries that poured in from architects in 27 countries, Papadakis and a panel of judges selected 62 of the most creative designs to be built. The houses are now on display in London—and up for sale. Early next month Sotheby's will auction them off one by one to the highest bidders.

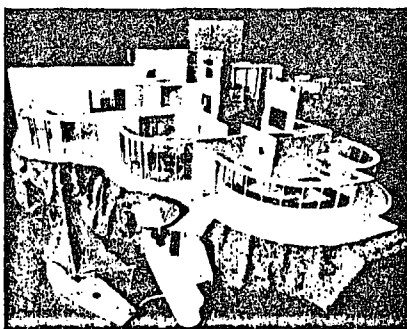
The models cover a broad spectrum of contemporary architectural styles. They range from "classical" doll's houses, which are little more than small-scale reproductions

of real homes, to futuristic constructions made of driftwood, playing cards, plastic or mirrors. One house has plastic walls with insects trapped inside the transparent panels; another is a hyper-modern cross between a space station and an oil rig that was inspired by a drawing by British architect Terry Farrell's eight-year-old son. Some of the designs have educational applications. One is constructed of separate blocks of varying shapes that can be rearranged to construct 362,880 different houses so children can learn about architecture. But other houses are pure whimsy. One features a crashed rocket ship in the front yard, while the doors and windows of another form human faces.

Strictly speaking, there are two winning entries—one chosen by Pa-

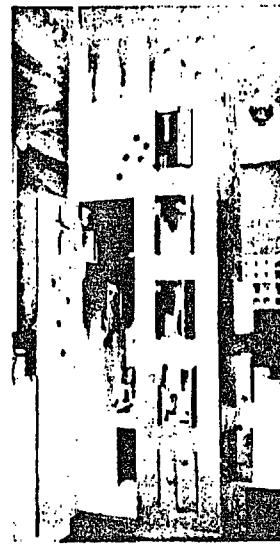
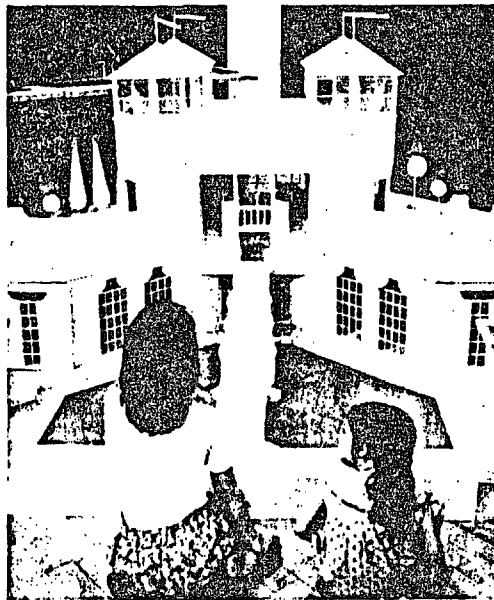
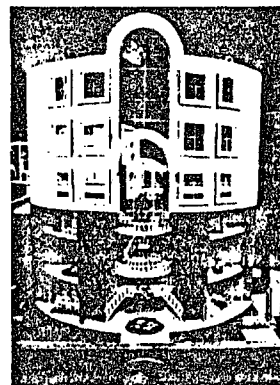
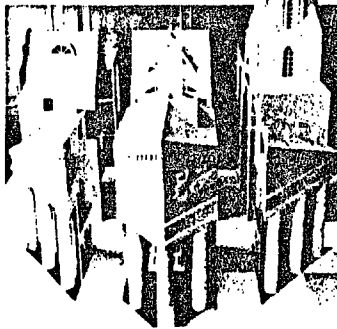
padakis's panel of experts, the other selected by a group of children. Predictably, the choices are very different. The adults favored a seven-foot-high gold-painted tower built by British architects Michael Gold and Paul Wellard. The house has a door just large enough to admit a child, who can sit and play in a room that takes up half the tower. But the kids opted for something more traditional: British architect Charlotte Baden-Powell's rambling California-style beach house, complete with miniature furniture in the living room, tiny herb bottles in the kitchen, small liquor bottles on a table and a tiny yacht anchored at a private jetty in a sea of glass.

As for Alexandra Papadakis, she is still without her own doll's house—though she had a chance to play with many of the models over the past year. Her father reportedly plans to be a bidder at the auction, where he just might buy Alexandra her favorite.



*Photos by Peter Marlow - Magnum*

*Dream creations: Baden-Powell's beach house (top left) and Gold and Wellard's tower (bottom right) capture top honors in an imaginative collection of Lilliputian designs ranging from classical severity to futuristic fantasies.*





Título do Texto: More than just Child's play.

Instruções : Siga a ordem das perguntas. Responda as questões em português. Não é permitido usar o dicionário.

I Leia o título do texto e procure associá-lo às fotos. Esta associação lhe trará alguma idéia do que tratará o texto.

II Leia rapidamente todo o texto sem se preocupar com as palavras desconhecidas. Após esta leitura escolha UMA destas alternativas:

O texto é sobre:

- ( ) um curso sobre projetos de casas de bonecas..
- ( ) um homem que construiu muitas casas de papel.
- ( ) um concurso de casas de bonecas.
- ( ) crianças que fizeram muitas casas para brincar.
- ( ) estilos arquitetônicos do futuro.

III Repare que o texto está dividido em 4 parágrafos. Para resumir o texto, leia novamente cada parágrafo. Depois, complete os dados de acordo com os itens abaixo.

§ A : Situação : Andreas Papadakis procurando .....

Problema encontrado : .....

Solução : Andreas lança um .....

§ B : Exemplos de modelos apresentados: os estilos variavam do .  
..... ao .....

Para ilustrar, o artigo descreve .....modelos.

§ C : Dois critérios de seleção :

a. escolhido por: .....

modelo premiado igual ao da foto de nº .....

b. escolhido por: .....

modelo premiado igual ao da foto de nº .....

§ D : Conclusão :

Alexandra .....

### On What Levels Can We Study the Organism?

The problem of understanding the functioning of the human organism is similar to the problem of understanding the working of an unknown highly complex machine. If someone showed us a computer in operation, we could learn something about it by observing the input to it (the punched paper tape) and the output from it (printed-out letters, words, and numbers and punched paper tape). If we could understand the paper-tape code, we would see that the message going into the computer consists both of material to be processed and instructions on how to process it; for example, a series of numbers with an instruction to add them. We might notice that some of the instructions refer to inputs that were presented to the machine at an earlier time, and from this we could infer that the machine has the capacity to store information in a "memory." From the fact that certain material is selected and transformed to produce the output, we could infer that there was an active processing unit. By observing inputs and outputs, we could construct a fairly accurate picture of the overall functions of the computer. This method of study is similar to the one we described for studying human beings. The psychologist can observe the inputs to the organism (*stimuli* from the environment) and outputs from the organism (*the behavior*). By observing both the situation and the behavior, the psychologist makes inferences about the kinds of functions that occur inside the organism. In the last chapter, we inferred that many of our habits, concepts, beliefs, and motives were learned from the cultural environment, stored inside the person, and activated to influence behavior under certain conditions (see Fig. 3-1).

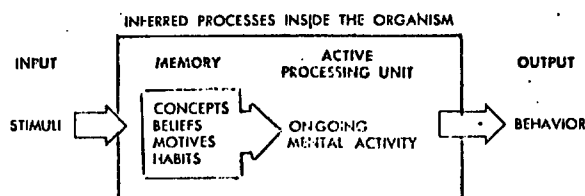


FIG. 3-1. One level on which we can study the organism is the behavioral level. Observations of the situation and behavior lead to inferences about processes occurring inside the organism.

However, there is another way to study the computer, and that is by taking the machine apart, looking at its components, and trying to understand the function of each component in its relation to the other components and in its relation to the whole machine.

McKeachie, W.J. & Doyle, C.L.  
Psychology. Massachusetts:  
 Addison-Wesley, 1966.

AIM : To test the three levels of comprehension :  
general, main points and detailed comprehension of a text.

TEXTO : On What Levels Can We Study the Organism ?

Instruções : Não é permitido usar o dicionário. Siga a ordem das perguntas.

I Leia todo o texto sem se preocupar com as palavras desconhecidas.

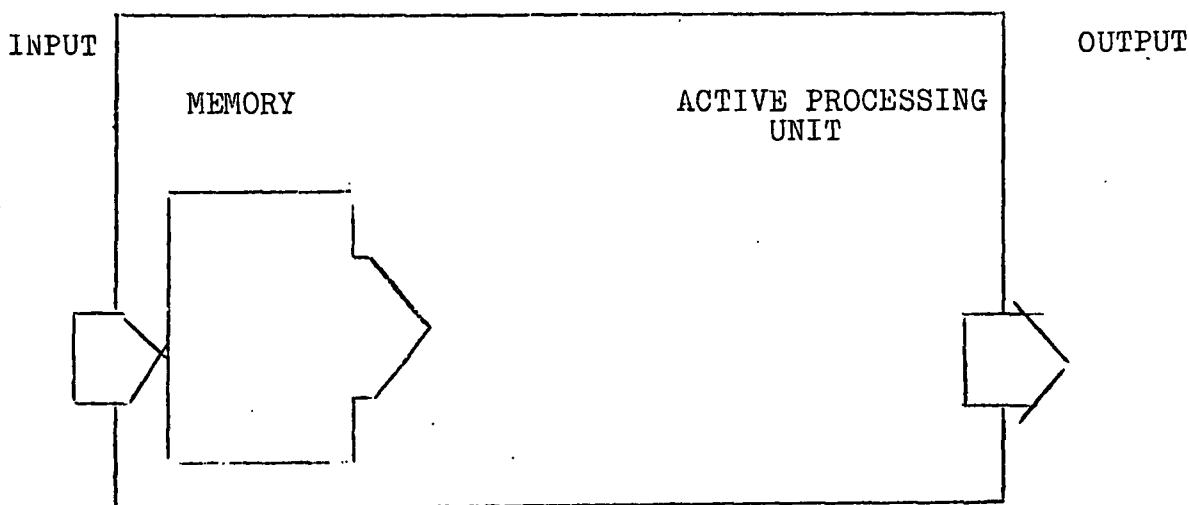
Qual é o assunto global do texto ? (Responda em português.)

\_\_\_\_\_

\_\_\_\_\_

II Leia novamente o texto e usando as informações do mesmo sobre uma máquina, complete a seguinte figura. (Complete em inglês)

INFERRED PROCESSES INSIDE THE .....



III Leia o texto e traduza as seguintes locuções, de acordo com o contexto em que elas ocorrem :

- a. an unknown highly complex machine (linha 2) \_\_\_\_\_
- b. paper-tape code (linha 6) \_\_\_\_\_
- c. an active processing unit (linha 13) \_\_\_\_\_
- d. overall functions (linha 15) \_\_\_\_\_
- e. cultural environment (linha 21) \_\_\_\_\_

IV Procure no texto 10 verbos que, na sua opinião são cognatos (parecidos ou semelhantes ao português). Escreva-os e dê a tradução de cada um.

Objetivo : Medir a compreensão geral.

Instrução : Demonstre que você entendeu de que trata o texto abaixo, JUSTIFICANDO, em não mais do que três linhas, o título do Texto : Eat Soup, Lose Weight. Responda em português.

Eat Soup, Lose Weight

Hot soup, according to a new study, may be able to help you lose weight by forcing you to practice better eating habits. The study, which involved almost 1,000 women, found that those who included soup with lunch consumed fewer calories not only at that meal but throughout the rest of the day as well. Several reasons why calories dropped when soup was added to the diet were suggested by Henry A. Jordan, M.D., director of the Institute for Behavioral Education, King of Prussia, Pennsylvania, who conducted the study: "Soup, unlike sandwiches and other finger foods, generally is eaten slowly, with a utensil and while you are sitting down. It requires that you pay attention."

Dr. Jordan's study proves what has long been a theoretical assumption: If you slow your rate of eating and increase your involvement with food, you'll eat less. Other foods that force you to slow down may work for dieters in the same way soup does. Instead of shelled nuts, high in calories and easy to eat, try shelling them yourself. Instead of gulping orange juice, try peeling an orange.

from : Self, January 1980.

Resposta :

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## Língua Inglesa Instrumental I

Nome \_\_\_\_\_

Data \_\_\_\_\_

Texto : Diseases of Nutrition

## Necessary Nutrients

Calories The body requires a source of energy to maintain the normal processes of life and to meet the demands of activity and growth. Calorie requirements depend mainly on body size, basal metabolic rate, activity, age, sex, and environmental temperature. Clinical diseases associated with calorie deficiency are marasmus in children and cachexia in adults. A 70-kg male requires approximately 70 calories per hour under basal conditions and up to 600 calories per hour for heavy muscular work, so that activity levels largely determine gain and loss of weight on a given diet. Carbohydrate and protein furnish about 4 calories per gram, alcohol about 7, and fat about 9. The report of the joint FAO/WHO Expert Committee on Energy and Protein Requirements (1973) provides more detailed information.

Cecil's Textbook of Medicine, 1979.

Exercícios:

I Na língua inglesa o adjetivo precede o substantivo, e.g.: clinical diseases = doenças clínicas. Traduza para o português as seguintes frases de acordo com o texto:

- a. normal processes of life:
- b. calorie requirements:
- c. basal metabolic rate:
- d. environmental temperature:
- e. a 70-kg male:
- f. very heavy muscular work:
- g. activity levels:

II No inglês há várias palavras cognatas (palavras semelhantes ou parecidas com o português), e.g. = o verbo depend : depender, depende.

Procure no texto mais 4 exemplos de verbos cognatos:

- a.
- b.
- c.
- d.

### Jojoba could stop the desert creep

A PLANT that grows wild in Mexico could help African farmers stop the spread of the Sahara—and earn valuable foreign currency. The plant is the jojoba (pronounced ho-ho-ba), which scientists have long known for its resistance to drought and for the versatile liquid wax that can be extracted from its seeds.

In the early 1970s a California professor, Demetrios Yermanos, carried out



Jojoba—bean of the future?

a series of tests that were impressive enough to convince hundreds of farmers in Arizona that there was money to be made from growing the crop. "The demand for a substitute for sperm whale oil, and for a lubricant to replace depleting fossil fuel reserves, has been a powerful incentive for development of jojoba," Yermanos says.

The plant grows about 30 cm a year, yields its first seed after three years, and reaches its full potential after nine or

10 years. Yermanos believes that a hectare of mature plants could produce 3000 kg of oil, which now sells at \$50 per litre, although the price will drop when more commercial seed comes onto the market.

But in the eyes of African and Arab farmers the most attractive aspect of the jojoba is its ability to thrive in marginal soils, with as little as 7.5 cm of rainfall a year. And apart from its first year, it does not need irrigation. The plant manages this because of its long tap root, which grows a huge 2.5 cm a day during the first month after planting. Yermanos has found jojoba bushes with roots as long as 30 metres.

The Sudanese government is experimenting with jojoba in six different regions, and officials say that the plant thrives better there than in its native Mexico. Representatives from 27 Arab and African countries met last month in Khartoum to look at Sudan's experience in growing the plants.

They decided it was a bush with the potential to stop "desert creep" and provide countries in the region with a new and valuable cash crop. The Sahara is expanding at a rate of 5 km a year. Farmers on the edge of the desert hope that if the plant can survive on land that is lying idle, and survive with minimum care, it may help to stop this creep.

Five countries—Saudi Arabia, Kuwait, Egypt, Morocco and Nigeria—are to experiment with the plant. But money could be a problem. A grant from the UN Development Programme to cultivate jojoba in the Sudan runs out this year and no other source of money has been forthcoming.

New Scientist 25 March 1982

Após ler o texto, relacione cada um destes 'resumos' com o parágrafo correspondente ao texto. A seguir, coloque-os em ordem conforme o mesmo:

- A grande vantagem do cultivo da jojoba é sua habilidade em crescer em solos secos e a não necessidade de irrigação após o seu primeiro ano de plantio. Isto se deve às suas longas raízes.
- A crescente procura por um substituto do óleo de baleia e de outra fonte de combustível fazem da jojoba um poderoso incentivo ao desenvolvimento de sua cultura.
- Há muitos países interessados no cultivo da jojoba. Um deles já a está cultivando, obtendo bons resultados.
- As grandes vantagens da jojoba são: sua resistência à seca e o aproveitamento do líquido extraído de suas sementes.
- Outros países vão fazer a experiência com a planta, porém o maior problema será o do financiamento por programas de desenvolvimento.
- A jojoba é uma planta que dentro de 9 a 10 anos já mostra o seu valor comercial. Atualmente o seu óleo vale muito, apesar de que pode baixar com o aumento do cultivo da planta.
- Representantes de muitos países da África acham que além de evitar a expansão do deserto a planta também trará novas divisas para suas economias.

Ordem correta destes parágrafos, de acordo com o texto : \_\_\_\_\_

Nome \_\_\_\_\_

Data \_\_\_\_\_

TEXTO :

### Survival Rates Are Up

- 1 HUMAN ORGAN TRANSPLANTATION in the United States is undergoing a major resurgence, largely because of improved anti-rejection procedures.
- 2 After making a much-heralded debut in the late 1960s, transplantation dropped off radically because of woefully poor survival rates. In 1968, 54 people received transplanted hearts, but at the end of the year only 24 had survived. By 1972 only 14 such operations were done.
- 3 In 1982, however, over 100 hearts were transplanted in North America. The one-year survival rate for heart recipients at Stanford University Medical Center, which is transplanting about a quarter of the total, is now about 80 percent.
- 4 One reason is the anti-rejection drug cyclosporine; an experimental substance that is expected to be approved for transplantation use this year. Cyclosporine is also credited by liver-transplant pioneer Dr. Thomas Starzl of the University of Pittsburgh with boosting the one-year survival rate of liver recipients from 35 percent five years ago to about 70 percent now.
- 5 Kidney transplants are being attempted with increasing frequency and are expected to number about 5000 in the United States this year alone. The two-year success rates for the transplanted organs are now 95 percent for those from live, related donors, and about 65 percent for those from cadavers.
- 6 With higher success rates and renewed demand for operations, however, a shortage of organs has resulted, producing waiting lists. Across the United States, for example, about 6000 people are awaiting kidney transplants.

—James Ricci in Knight-Ridder Newspapers

Reader's Digest June, 1983

Após ter lido o texto, complete a seguinte tabela conforme os dados:

TIME	NUMBER OF TRANSPLANTATIONS
	debut
1968	
end of	
	14
	over

APPENDIX 4  
PRE-TEST AND POST-TEST - FIRST PART



## PRÉ-TESTE

## 1ª PARTE

INSTRUÇÕES: Após ter lido o texto cuidadosamente, você deverá selecionar, dentre as alternativas dadas, aquela que melhor completa o sentido do período ou do parágrafo e que está gramaticalmente correta.

## The Wonderful World of Insects

A naturalist might conclude that God takes great joy (prazer) in creating insects, for our earth has so many of the complex little creatures that no one knows how many different kinds there are. Approximately 750,000 species have \_\_\_\_\_ (1) \_\_\_\_\_ classified. About 4,000 new varieties \_\_\_\_\_ (2) \_\_\_\_\_ found every year. Entomologists (persons who study insects), predict \_\_\_\_\_ (3) \_\_\_\_\_ when all our earth's insects have been \_\_\_\_\_ (4) \_\_\_\_\_ the final number may be far into \_\_\_\_\_ (5) \_\_\_\_\_ millions.

The members of this vast and marvellous groups of \_\_\_\_\_ (6) \_\_\_\_\_ things have assumed many different forms \_\_\_\_\_ (7) \_\_\_\_\_ habits making it possible for them to deal \_\_\_\_\_ (8) \_\_\_\_\_ life under almost any circumstances. \_\_\_\_\_ (9) \_\_\_\_\_ are insects so tiny (pequenos), and so intensely specialized, that they \_\_\_\_\_ (10) \_\_\_\_\_ on the tongues of mosquitoes. There are \_\_\_\_\_ (11) \_\_\_\_\_ whose lives under the sun are \_\_\_\_\_ (12) \_\_\_\_\_ brief (breves) that they have neither mouths \_\_\_\_\_ (13) \_\_\_\_\_ stomachs and never eat at all.

In spite of \_\_\_\_\_ (14) \_\_\_\_\_ great differences, all insects have certain things \_\_\_\_\_ (15) \_\_\_\_\_ common. The lovely giant moth (mariposas) enchant \_\_\_\_\_ (16) \_\_\_\_\_ when they come beating their beautiful \_\_\_\_\_ (17) \_\_\_\_\_ at our summer screens. But basically \_\_\_\_\_ (18) \_\_\_\_\_ are all a similar kind \_\_\_\_\_ (19) \_\_\_\_\_ living machine. To learn something of their make-up \_\_\_\_\_ (20) \_\_\_\_\_ to be introduced to extraordinary wonders.

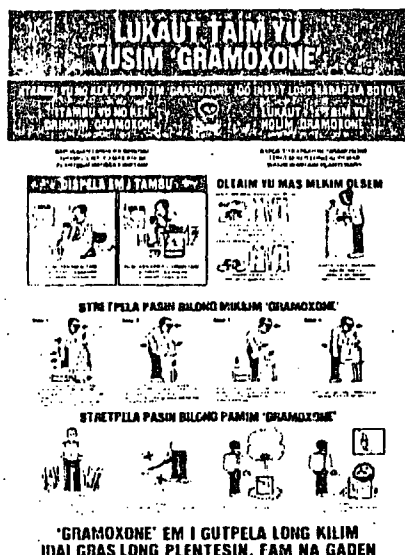
- |       |               |                |             |              |
|-------|---------------|----------------|-------------|--------------|
| ( 1 ) | a) be         | b) are         | c) been     | d) had       |
| ( 2 ) | a) are        | b) is          | c) be       | d) been      |
| ( 3 ) | a) if         | b) so          | c) though   | d) that      |
| ( 4 ) | a) discovered | b) discovering | c) discover | d) discovers |
| ( 5 ) | a) a          | b) the         | c) an       | d) and       |
| ( 6 ) | a) lives      | b) lived       | c) living   | d) live      |
| ( 7 ) | a) yet        | b) so          | c) but      | d) and       |
| ( 8 ) | a) of         | b) about       | c) with     | d) on        |
| ( 9 ) | a) they       | b) that        | c) there    | d) each      |
| (10)  | a) lives      | b) live        | c) lived    | d) living    |
| (11)  | a) none       | b) any         | c) others   | d) other     |
| (12)  | a) so         | b) as          | c) any      | d) with      |
| (13)  | a) plus       | b) their       | c) about    | d) nor       |
| (14)  | a) their      | b) them        | c) its      | d) they      |
| (15)  | a) on         | b) at          | c) of       | d) in        |
| (16)  | a) we         | b) us          | c) our      | d) ours      |
| (17)  | a) legs       | b) bodies      | c) tails    | d) wings     |
| (18)  | a) its        | b) them        | c) there    | d) they      |
| (19)  | a) about      | b) from        | c) of       | d) in        |
| (20)  | a) they       | b) in          | c) is       | d) and       |

APPENDIX 5  
PRE-TEST AND POST-TEST - SECOND PART

## Pesticides: exporting death

Britain is now tightening its controls over the use of pesticides. But the new legislation will do nothing to protect vulnerable farmers in the Third World

Catherine Caufield



Theory vs practice: farmers cannot afford boots or gloves

- A** IN TODAY'S agriculture one nation's meat often depends on another nation's poison. Pesticides are one of the cornerstones of modern farming, but they are poisons nonetheless and must be handled with care. The British government gives British farmers considerable help in doing so. It publishes official lists of the pesticides it considers safe, with detailed instructions on how and when to use them. Pesticides judged to be unsafe are banned from sale by a 27-year-old voluntary agreement between the government and the agrochemicals industry. Next November, however, the government, concerned by recent breaches of this voluntary compact and spurred on by the EEC, plans to introduce statutory controls over the sale and use of pesticides. But will its proposals do anything to protect the people most at risk, the millions of peasant farmers in developing countries who use pesticides manufactured in Britain?
- B** Britain is the third largest exporter of pesticides in the world. In 1983 more than half the income of the British pesticide industry came from export sales. Britain supplies 15 per cent of all the pesticides in international trade. Among the products made here and sold to developing countries are many with active ingredients such as disulfoton, terbufos, and DNOC whose use is banned or severely restricted in Britain and other industrialised nations. Yet there are no laws ensuring that these exports are properly made or labelled, or that the importing countries are informed of the hazards.
- C** Though developing countries use less than one-quarter of the world's pesticides, they suffer three-quarters of all pesticide fatalities. According to Oxfam, 375 000 people in the Third World are poisoned—10 000 fatally—by pesticides each year. These figures do not include chronic or long-term damage such as cancers, birth defects or sterility, nor do they include suicide poisonings. And pesticide use is expanding much more rapidly in developing countries than elsewhere.
- 35** Between 1964 and 1974 the use of pesticides in Africa grew by

500 per cent. In the Philippines imports quadrupled between 1972 and 1978.

One reason for this growth is the increasingly strict control on pesticide use in the industrialised world. As these governments tighten their restrictions, more and more companies are looking to the open market of the Third World, where pesticide controls are lax. In 1979, 25 per cent of pesticides exported to the Third World by the US were banned or unregistered in the US. It is impossible to make the same calculations for British exports, because records of pesticide imports and exports are secret. A recent survey by the International Pesticide Industry Association found that 51 countries have fairly tough restrictions on pesticide imports, 43 have less stringent controls, and 41 have no formal controls. But legislation is meaningless without enforcement. Among the 51 "best" countries are several, including Brazil, Sri Lanka, Mexico, India, Indonesia, Malaysia and Thailand, where controls on the import and use of pesticides are often very weak in practice.

**55** In many developing countries hazardous chemicals are sold over the counter, often in unmarked or misleadingly labelled containers. Last May, 19 Senegalese villagers, including several young children, died after eating food prepared with oil taken from a bottle that had contained parathion-ethyl, an insecticide that has been severely restricted in the industrialised nations for many years, but is still freely available throughout the developing world.

**TÍTULO DO TEXTO: Pesticide: Exporting Death.**

**Fonte: New Scientist. August 16, 1984.**

**INSTRUÇÕES:** Não é permitido usar o dicionário.

Responda às questões em português.

Siga a ordem das perguntas. Responda na sequência apresentada e não volte atrás.

- I Leia e reflita sobre o título e o subtítulo do texto. Depois assinale quantas alternativas você julgar possíveis.  
O texto a ser lido abordará os seguintes assuntos:
- ( ) os perigos dos agrotóxicos para a saúde.
  - ( ) países que usam agrotóxicos.
  - ( ) a alimentação no Terceiro Mundo.
  - ( ) a agricultura no Brasil.
  - ( ) a exportação de agrotóxicos.
  - ( ) produtos que causam morte.
- II Leia todo o texto sem se preocupar com as palavras desconhecidas. Repare que o texto está dividido em 5 parágrafos (A, B, C, D e E).  
Qual é o assunto global do texto? \_\_\_\_\_
- 
- III Leia o parágrafo A novamente e responda à seguinte pergunta:  
A que nações o autor está se referindo ao escrever: "In today's agriculture one nation's meat often depends on another nation's poison". [2]
- 1.
  - 2.
  - 3.
- IV Leia o parágrafo B e responda à seguinte pergunta:  
Qual é o papel da Grã-Bretanha na indústria e exportação de agrotóxicos? [3]
- 1.
  - 2.
  - 3.
- V Leia o parágrafo C para responder à seguinte pergunta:  
Além das 375.000 pessoas que são envenenadas (das quais 10.000 são casos fatais) no Terceiro Mundo, que outros danos os agrotóxicos podem causar? [4]
- 1.
  - 2.
  - 3.
  - 4.
- VI Leia os parágrafos C e D. Responda à seguinte pergunta:  
Por que o uso de agrotóxicos está aumentando nos países do Terceiro Mundo? [1]
- VII Leia o texto e traduza as palavras ou locuções, de acordo com o contexto em que elas ocorrem: [6]
- a. 27-year old voluntary agreement (linha 9)
  - b. export sales (linha 19)
  - c. ensuring (linha 25)
  - d. hazard (linha 26)
  - e. long-term damage (linha 31)
  - f. lax (linha 42)
- VIII Leia o texto e verifique a que palavras ou expressões as palavras sublinhadas abaixo se referem (escreva em português): [4]
- a. help in doing **so** (linha 5)
  - b. But will **its** proposals (linha 14)
  - c. **they** suffer three-quarters (linha 28)
  - d. **These** figures do not (linha 31)

APPENDICES 6-13  
PRE-TEST AND POST-TEST - **THIRD PART**

## ENDOCRINE MECHANISM IN NUTRITIONAL ADAPTATION

Fernando Mönckeberg B.

**A** 1 The literature on endocrine studies of malnourished children is presently in a state of controversy and confusion.

**B** 5 This results from many considerations, primarily the tendency to oversimplify the etiology of malnutrition, which, in fact, is a complex process influenced by many different factors that in each geographical area may act in varying ways resulting in diverse clinical syndromes. In 10 consequence of these variables, a conflicting terminology has developed; the same term has a particular meaning for each author. Again, some of the controversial results can be explained because the response to endocrine studies in 15 malnutrition varies. Patient response differs: (a) in accordance with the duration and degree of malnutrition; (b) in accordance with the existence of concomitant diseases; (c) the age of the patient; (d) and finally the stage at 20 which tests are performed—before or during recovery. With respect to the last, from the biochemical standpoint, recovery does not always coincide in time with the initiation of weight increase. For example, during treatment of 25 marasmic infants, an increase in oxygen consumption has been observed (25), which precedes increase in weight by several days.

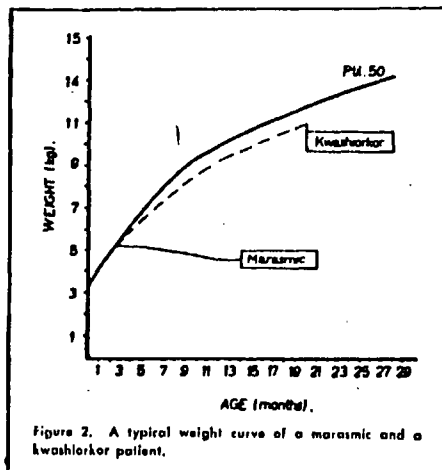
**C** Further confusion results from the fact that few authors provide a detailed description of 30 the patients that they are studying, and hence, again, patients with different clinical characteristics are grouped under the same syndrome. In view of the above, it is important to define the clinical characteristics of the patients that have 35 been studied before reporting an experience.

Two types of malnutrition are generally recognized in children: marasmus and kwashiorkor. Marasmus is due to low caloric and protein intake, whereas kwashiorkor is due mainly to protein deficiency (23). In typical cases the symptoms are, of course, quite characteristic; however, typical cases are exceptional, most cases are of mixed etiology, and consequently present a mixed symptomatology.

45 In order to clarify the two syndromes, typical kwashiorkor cases are considered to be those whose etiology corresponds to a protein deficiency alone. In this type of malnutrition the disease is acute, and the whole symptomatology appears after a short period of protein deficiency. The child's growth has been normal or near normal during the first year of life, then suddenly a protein restriction—due to many socioeconomic factors—unchains the whole symptomatology. Though this type of patient is very 55 infrequent, they have been particularly selected in order to study more clearly the effects of protein restriction upon the different biochemical parameters.

60 Selected marasmic patients correspond to those with malnutrition from their first months of life, and at one year of age they have almost the same weight and height as at birth. These patients had been breast-fed for a very short period of 65 time; they then all had a very serious hypoalbuminemia with very diluted milk, with or without the addition of carbohydrate. No evidence of edema was found, and the changes of skin and hair, typical in kwashiorkor, were minimal 70 or not present.

Both the marasmic and kwashiorkor cases selected were free of other concomitant diseases, and studies were initiated before treatment was started. Figure 2 shows a typical weight curve 75 of a marasmic and a kwashiorkor patient.



### Metabolic Adaptation and Nutrition.

Pan American Health Organization,  
 Washington, D.C., 1971.

**TÍTULO DO TEXTO: Endocrine Mechanism in Nutritional Adaptation.**

**INSTRUÇÕES:** Não é permitido usar o dicionário.

Responda às questões em português.

Siga a ordem das perguntas. Responda na sequência apresentada e não volte atrás.

- I Leia e reflita sobre o título e o subtítulo do texto. Depois assinale quantas alternativas você julgar possíveis.  
O texto a ser lido possivelmente incluirá os seguintes assuntos:
- ( ) doenças relacionadas à alimentação.
  - ( ) a importância da boa alimentação.
  - ( ) manifestações alérgicas devido à alimentação.
  - ( ) crianças com problemas alimentares.
  - ( ) as vitaminas na alimentação.
  - ( ) tipos de doenças causadas pela subnutrição.
- II Leia todo o texto sem se preocupar com as palavras desconhecidas. Repare que o texto está dividido em 7 parágrafos (A, B, C, D, E, F, e G).  
Qual é o assunto global do texto? \_\_\_\_\_
- 
- III Leia os três primeiros parágrafos (A, B e C) novamente e responda à seguinte pergunta:  
De acordo com os parágrafos B e C, quais são as razões da controvérsia e confusão citadas pelo autor no parágrafo A? [3]
- 1.
  - 2.
  - 3.
- IV De acordo com o parágrafo C, por que é importante saber se os testes foram feitos antes ou depois da recuperação do paciente? [2]
- V Leia o parágrafo D para responder à seguinte pergunta:  
Qual é a diferença básica entre os tipos de doença? [2]
- VI Leia o parágrafo E e responda à seguinte pergunta:  
Qual é a característica sintomatológica do tipo de doença **kwashiorkor**? [1]
- VII Leia o parágrafo F e responda à seguinte pergunta:  
Qual é a característica sintomatológica do tipo de doença **marasmus**? [2]
- VIII Leia o texto e traduza as palavras ou locuções, de acordo com o contexto em que elas ocorrem: [6]
- a. malnourished children (linha 1)
  - b. weight increase (linha 24)
  - c. different clinical characteristics (linha 31)
  - d. due (linha 38)
  - e. Whereas (linha 39)
  - f. unchains (linha 54)
- IX Leia o texto e verifique a que palavras ou expressões as palavras sublinhadas abaixo se referem: [4]
- a. **This** results from many (linha 4)
  - b. With respect to **the last** (linha 21)
  - c. cases are considered to be **those** (linha 46)
  - d. Though **this type** of patient (linha 55)

## Ways of seeing

How does the world look to a fly? Its compound eye, so different from the vertebrate camera eye, has its own distinctive strengths

Stephen Young

**A** EYES are among the most intricate and highly adapted instruments on the biological scene. This is as true of the compound eye of insects and crustaceans as it is of the more familiar "camera" eye of the vertebrates. Extraordinary precision goes into constructing a compound eye such as the dragonfly's with its 30 000 facets, each one the aperture of a minute optical system.



The compound eyes of an ant make it difficult to sneak up on

**B** Part of the fascination of the compound eye resides in the anatomical differences between the compound eye and our own.

**10** It is almost as though the two kinds of eye were designed by different engineers. In a sense, the differences are only skin deep, since there are profound biochemical similarities between the camera eye and the compound eye. Even so, it seems odd that evolution has generated two such radically different mechanisms for looking at the world. But visual scientists, such as Kuno Kirschfeld, Mike Land and Allan Snyder, have shown that each type of eye has distinctive strengths that make it suitable for particular tasks.

**C** Take resolving power, for example. The degree of detail that an eye can discern in a field of view depends both on the number of sensory elements viewing that field—the grain—and on the quality of the image produced by that eye. The smaller the eye's aperture, the more the quality of the image tends to be degraded by diffraction.

**25** So, in theory, the resolution of a camera eye can be far superior to that of a similarly sized compound eye, simply because it has a much larger aperture than the ommatidia.

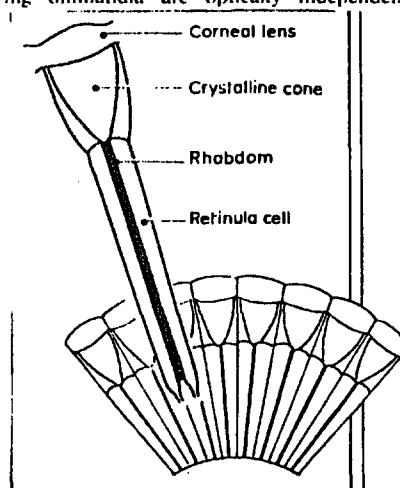
**D** Consequently, the resolving power of a compound eye tends to be somewhat limited by our standards. The eye of the honeybee, for example, has a visual acuity about 100 times inferior to ours. A compound eye can achieve high resolving power only by being enormous, so as to accommodate a large number of facets. Kirschfeld at Tübingen has calculated the size of the hypothetical compound eye that would rival the

human eye in its resolving power. Such an eye would have to be about a metre in diameter. Low resolution need not be a drawback, though. Animals such as insects, Kirschfeld believes, have no need of such high acuity, because matters of importance take place quite close to them and loom rather large. There is a simple relationship between resolving power and body size, which holds good for many animals, regardless of the type of eye that they happen to have.

**E** There can be advantages in viewing the world through a compound eye. In the sphere of image brightness—a useful indicator of overall sensitivity to light—some compound eyes are as good as, or even superior to, our camera eye. Certain moths employ optics that allow them to achieve an image 25 times brighter than that of a human eye viewing the same scene. There is another bonus too. Compound eyes avoid a major drawback associated with camera eyes: loss of optical quality (and with it, potential for high acuity) away from the eye's optic axis caused by optical aberrations. These imperfections become more pronounced in parts of the eye remote from its central axis. Compound eyes evade this problem since each

ommatidium always receives light close to its axis. Consequently, such eyes can be shaped to intercept light equally well from any direction—as anyone who has tried to sneak up on a dragonfly from behind will know.

**F** Compound eyes come in more than one design. There are four major variations on the theme, although not all compound eyes fit neatly into the classification. The key factor differentiating the four is the extent to which neighbouring ommatidia are optically independent.



A compound eye is a cluster of separate units, called ommatidia, complete with lenses that focus light onto light-sensitive retinular cells



TÍTULO DO TEXTO: **Ways of Seeing.**

Fonte: **New Scientist.** August 16, 1984.

151

INSTRUÇÕES: Não é permitido usar o dicionário.

Responda às questões em português.

Siga a ordem das perguntas. Responda na seqüência apresentada e não volte atrás.

- I Leia e reflita sobre o título e o subtítulo do texto. Depois assinale quantas alternativas você julgar possíveis.  
O texto a ser lido possivelmente incluirá os seguintes assuntos:
- ( ) o mundo para os insetos.
  - ( ) a anatomia comparada do olho de vertebrados.
  - ( ) a visão das moscas.
  - ( ) anomalias da visão.
  - ( ) olhos compostos: a imagem dos objetos.
  - ( ) o olho na espécie humana.
- II Leia todo o texto sem se preocupar com as palavras desconhecidas. Repare que o texto está dividido em 6 parágrafos (A, B, C, E, E e F).  
Qual é o assunto global do texto? \_\_\_\_\_
- 
- III Leia o parágrafo A novamente e responda à seguinte pergunta:  
A afirmação de que "Eyes are among the most intricate and highly adapted instruments on the biological scene" é verdadeira para que tipos de olhos? [2]
- IV Leia o parágrafo B para explicar:  
Por que, apesar das diferenças entre os dois tipos de olhos, a visão do mundo é igual para ambos? [2]
- V Leia os parágrafos C e D para responder à seguinte pergunta:  
Por que a acuidade visual de uma abelha é 100 vezes inferior à dos humanos? [2]
- VI Leia o parágrafo E e responda às seguintes perguntas:
- quais são as duas vantagens do olho composto? [2]
    - 
    -
  - Explique por que os olhos compostos podem interceptar a luz de qualquer direção? [2]
- VII Leia o texto e traduza as palavras ou locuções, de acordo com o contexto em que elas ocorrem: [6]
- facets (linha 7)
  - similarly sized compound eye (linha 26)
  - visual acuity (linha 31)
  - drawback (linha 37)
  - regardless (linha 41)
  - four major variations (linha 76)
- VIII Leia o texto e verifique a que palavras ou expressões as palavras sublinhadas se referem: [4]
- This** is true (linha 2)
  - make **it** suitable (linha 18)
  - such** an eye (linha 35)
  - this** problem (linha 70)

## MEDICINE

## New Skin for Burn Victims

**A** It began with childish mischief. On a warm summer day last year, Jamie Selby, five, and his six-year-old brother, Glen, took off their clothes and covered their bodies with bright splashes of paint. Then fun turned into nightmare: as they were cleaning themselves with a solvent, the boys accidentally came in contact with a flame. Both suffered third-degree burns over more than 80 percent of their bodies. Statistically, the chances of surviving such catastrophic burns are close to zero. But a year later Jamie and Glen are alive and walking about, because of an extraordinary new treatment in which researchers actually "grew" a fresh supply of skin from the boys' own bodies.

**B** Severe burns over a large area of the body always pose a life-threatening crisis because of the risk of infection and fluid loss. Artificial and cadaver skin can provide temporary protection, but the patient's immune system will eventually reject them. The usual procedure is to remove a section of skin from another area of the body and transfer it to the wound site. But in cases of massive injury, "you run out of donor sites," explains Dr. G. Gregory Gallico III, a plastic surgeon who operated on the young brothers at Boston's Shriners Burn Institute, which is staffed by physicians from Massachusetts General Hospital.

**C** Stamped Taken first to Children's Hospital in Denver, the Selbys were flown a week later to Boston because of the pioneering "substitute skin" research being conducted there by Dr. Howard Green, chairman of the department of physiology and biophysics at Harvard Medical School. For the past decade Green has been growing sheets of

postage stamps. In his lab, the square-inch specimens are ground up to separate the individual epithelial cells and placed in a flask containing growth-stimulating substances. The cells in the flask soon fuse into multicelled colonies, and within three or four weeks Green and his colleagues can



Gallico with skin cells on gauze patch

grow enough skin to cover even an adult patient's entire body.

**D** Since 1980 Gallico and Dr. Nicholas O'Connor of Boston's Brigham and Women's Hospital had used the Green procedure to perform small grafts on eight burn patients. Although the Selbys' burns were far

more extensive than the others they had treated, says Gallico, "we couldn't refuse. The alternative would have been to let the boys die."

**E** Reporting in last week's New England Journal of Medicine, the researchers described how they used snippets of skin from the youngsters' armpits to grow a total of one square yard of skin for each child. Each piece of new skin, which Green says looks like "a sheet of wet tissue paper," was placed on a piece of gauze covered with petroleum jelly. Then, in a series of lengthy operations performed over a period of more than four months, the sections of gauze-covered skin were sutured to the brothers' exposed layers of muscle as many as 55 grafts were done at a time. During the long ordeal, the boys received antibiotics to prevent infection and intravenous fluids to avoid dehydration. Their remaining wounds were covered temporarily with cadaver skin or with grafts from the less severely burned parts of their bodies.

**F** Soft: Over time the patches of grafted skin meshed together, creating a shiny pink layer of tissue that is thinner than normal skin and does not contain hair follicles. The new covering remains soft and supple enough after a year for the boys to move about, although they still face a lengthy regimen of physical therapy to limber up their joints, as well as extensive reconstructive and cosmetic surgery.

**G** The Boston researchers caution that the procedure is still highly experimental. It will take a number of years and additional patients, Gallico explains, to assess the "test tube" skin's long-term durability and flexibility. But if all goes well, the remarkable new technique could have even wider applications—proving useful not just for burn victims but for any patient with extensive skin damage from trauma or disease.

JEAN SELIGMANN with STEVEN CRAHILL in Boston

TÍTULO DO TEXTO: **New Skin for Burn Victims.**Fonte: **Newsweek**. . Aug.27, 1984.

INSTRUÇÕES: Não é permitido usar o dicionário.

Responda as questões em português.

Siga a ordem das perguntas. Responda na sequência apresentada e não volte atrás.

- I Leia e reflita sobre o título do texto. Depois assinale quantas alternativas você julgar possíveis.  
O texto a ser lido possivelmente incluirá os seguintes assuntos:
- ( ) novos tipos de cirurgias.
  - ( ) pesquisas com pacientes queimados.
  - ( ) casos de doenças de pele.
  - ( ) recuperação de pacientes com problemas de pele.
  - ( ) substituição de pele com pacientes queimados.
- II Leia todo o texto sem se preocupar com as palavras desconhecidas. Repare que o texto está dividido em 7 parágrafos (A, B, C, D, E, F, e G). Qual é o assunto global do texto? \_\_\_\_\_
- 
- III Leia o parágrafo A novamente e responda às seguintes perguntas:
- Como se queimaram Jamie e Glen? [2]
  - Qual foi o novo tratamento usado nas crianças? [2]
- IV Leia o parágrafo B para responder às seguintes perguntas:
- Qual é o procedimento clínico em casos de queimaduras? [2]
  - Qual é o problema quando a área afetada é grande? [2]
- V Leia o parágrafo C para responder à seguinte pergunta:
- Por que se pode dizer que Green "cultiva" pele? [2]
- VI Leia os parágrafos E e F e responda à seguinte pergunta:
- Quais os dois estágios pelos quais passaram os pedaços de peles "cultivados" pela equipe do Dr. Gallico? [2]
- -
- VII Leia o parágrafo G para responder à seguinte pergunta:
- Qual seria uma outra utilidade dessa nova técnica? [2]
- VIII Leia o texto e traduza as palavras ou locuções, de acordo com o contexto em que elas ocorrem: [6]
- life-threatening crisis (linha 18)
  - staffed (linha 30)
  - pioneering 'substitute skin' research (linha 35)
  - growth-stimulating substance (linha 44)
  - within (linha 46)
  - grafts (linha 53)
- IX Leia o texto e verifique a que palavras ou locuções as palavras sublinhadas abaixo se referem: [4]
- reject **them** (linha 23)
  - being conducted **there** (linha 36)
  - than the **others** (linha 55)
  - Their** remaining wounds (linha 75)

# Air, a measure of pollution

R Perry and R M Harrison

Plants, animals and man are all adversely affected by exposure to air pollutants too small to cause acute poisoning. This realisation has led to a search for quicker and more specific methods of monitoring and analysing ambient air.

**A** 1 Although public awareness of air pollution problems is far greater than ever before, the search for reliable methods of analysis of air pollutants is not new. Especially in the field of industrial hygiene, it has been important to have accurate means of assessing exposures to airborne pollutants. Urban episodes such as the London smog of the 1950s which have caused increased morbidity and mortality, or simply discomfort to many, have highlighted air pollution problems and forced governments to implement emission standards and set air quality goals. Doses of air pollutants too small to cause acute clinical symptoms of poisoning may cause long-term injury in humans and animals, as well as aggravating existing health complaints and can also severely affect the growth of plants. This realisation has stimulated research into methods of measurement of the low levels of many pollutants generally encountered in ambient air.

**B** Older methods of analysis commonly involved lengthy sample collection periods during which sufficient sample was accumulated for detection by a relatively insensitive analytical method. Recently developed procedures often allow continuous monitoring of pollutants due to their far higher sensitivity. Drawbacks of the extended sampling periods include the inability to measure peak and minimum concentra-

tions of pollutants, most of which are subject to considerable temporal variation, and the lengthy period required to obtain results when the collected sample has had to be transported back to the laboratory for analysis. Many methods were incapable of yielding information on other than long-term average levels. A further drawback of some methods is the lack of specificity. Hence, for example, the measurement of sulphur dioxide by absorption in hydrogen peroxide and titration of the resultant sulphuric acid (1) is a cheap and simple method used by the National Survey<sup>1</sup> but is subject to interference by acidic or basic air pollutants.



Hydrogen chloride gas, commonly emitted, for example, by municipal incinerators, if present in the air sample will cause elevated results, whilst ammonia, present at significant levels in rural air, will cause a reduction in the measured level. Although some more refined absorption techniques, such as the coulometric West-Gaeke technique for sulphur dioxide<sup>2</sup> where reagents are added to suppress interferences and improve specificity, are far more sophisticated the specificity of modern instrumental techniques is generally far higher and the response times are shorter.

## Gaseous pollutants

**D** Before considering available analytical procedures, it is important to differentiate between source and ambient monitoring. Source monitoring involves the measurement of air pollutants at their source, ie at the factory stack or the vehicle exhaust pipe. Ambient measurements involve sampling the air which the urban

population or the industrial worker actually breathes. Hence generally the measurement of ambient levels requires more sensitive methods and techniques used for ambient monitoring are normally applicable to source measurements but the converse may not be true. The following methods, unless otherwise stated, are suitable for both ambient and source monitoring. The most commonly used techniques are summarised in Table 1.

## Hydrocarbons

Techniques for determination of total hydrocarbons (THC) in air do not require an exceptional sensitivity since a natural background of 1-2 ppm (v/v) of methane exists throughout the troposphere (atmosphere below ~ 10 km) and anthropogenic release may contribute to substantially elevated local levels of hydrocarbons.

For some years non-dispersive infrared (ndir) was a technique much used for total hydrocarbon measurements. Using a long-path cell, the ir absorbance of polluted air at the wavelength corresponding to the C-H stretching vibration is continuously determined relative to that of air containing no hydrocarbons. This is achieved without dispersion of the ir radiation by using cells containing *n*-hexane vapour at a reduced pressure as detectors for two beams which are chopped at a frequency of 10 Hz and passed through sample and reference cells. Absorption of radiation by the hexane causes a differential pressure between the two detector cells which is sensed by a flexible diaphragm between them<sup>3</sup>. The method is of barely adequate sensitivity for ambient measurements and shows a very variable sensitivity towards different hydrocarbons as a result of the varying wavelength, and intensities of absorption by different compounds. The sensitivity per carbon atom in the molecule is similar for most alkenic compounds except methane but is substantially less for alkenes and aromatics and the method is almost totally insensitive to acety-

Roger Perry is a lecturer in public health engineering at Imperial College, Imperial Institute Road, London SW7 and has been awarded the Public Works Company MacLaughlin Award for 1976. Roy M. Harrison is a lecturer in atmospheric chemistry in the Department of Environmental Sciences, University of Lancaster, Lancaster LA1 4YQ.

TÍTULO DO TEXTO: Air, a measure of pollution.

Fonte: Chemistry in Britain. Vol.12(6). June 1986.

INSTRUÇÕES: Não é permitido usar o dicionário.

Responda às questões em português.

Siga a ordem das perguntas. Responda na sequência apresentada e não volte atrás.

- I Leia e reflita sobre o título e o subtítulo do texto. Depois assinale quantas alternativas você julgar possíveis.  
O texto a ser lido possivelmente incluirá os seguintes assuntos:
- ( ) doenças causadas pela poluição do ar.
  - ( ) maneiras de combater a poluição.
  - ( ) nova política contra a poluição do ar.
  - ( ) a poluição do ar.
  - ( ) pesquisas relacionadas com a poluição do ar.
  - ( ) regiões afetadas pela poluição.
- II Leia todo o texto sem se preocupar com as palavras desconhecidas. Repare que o texto está dividido em 4 parágrafos (A, B, C e D).  
Qual é o assunto global do texto? \_\_\_\_\_
- III Leia o parágrafo A novamente e responda às seguintes perguntas:
- Por que o autor do artigo cita um fato ocorrido em Londres nos anos 50? [1]
  - A poluição do ar pode causar que tipos de danos nestes seres: [3]
    - humanos e animais = a.
    - plantas = a.
- IV Leia os parágrafos B e C para responder às seguintes perguntas:
- O que caracterizava os antigos métodos de análise e medição da poluição do ar? [2]
  - Cite 2 desvantagens de alguns métodos de medição. [2]
    - 
    -
- V Leia o parágrafo D para responder à seguinte pergunta:  
Qual é a diferença entre o controle de poluição na fonte e controle de poluição ambiental? [2]
- VI Leia o texto e traduza as palavras ou locuções, de acordo com o contexto em que elas ocorrem: [6]
- industrial hygiene (linha 6)
  - highlighted (linha 13)
  - air quality goals (linha 16)
  - lengthy sample collection (linha 28)
  - due (linha 34)
  - drawback (linha 48)
- VII Leia o texto e verifique a que palavras ou expressões as palavras sublinhadas abaixo se referem: [4]
- This realization (linha 23)
  - during which (linha 29)
  - most of which (linha 39)
  - at their source (linha 82)

# Doing physics with microcomputers

An ordinary personal computer can be used  
to do large-scale calculations in physics at a great savings in cost  
and added personal convenience for the researcher.

Per Bak

- A 1 In the past year or so, the sale of microcomputers has increased from a few thousand to millions a year. Today, you can walk into a toy store and buy a computer for a few hundred dollars. Most micros are probably used for recreation, and until recently they have not been taken very seriously by scientists.
- B 10 But we are in the middle of a revolution; I believe that in the near future most calculations in physics will be done on these "home computers." The cost will be but a fraction of that for central-processor time at a typical computer center. Moreover, the microcomputer is accessible to physicists 24 hours a day; when a problem arises, physicists can start calculating, thereby avoiding the delay and other annoyances that arise when dealing with funding and computer-center bureaucracies. Physicists will be in full control and will be able to plan their work accordingly. In this article, I plan to demonstrate that today's off-the-shelf micros can perform very demanding physics calculations at speeds not much slower than those of modern full-size computers.
- C 30 Technically, there is little difference between a microcomputer and a large computer. In both, the brain is the central processing unit, which performs extremely simple manipulations—additions, subtractions and logical operations, for example—with numbers stored in the memory. All information must pass through this bottleneck. In the home computer, the cpu is a simple microprocessor. A large computer has more memory and more peripheral equipment, and so it is well suited for handling huge quantities of data, each piece of which requires a small amount of simple processing (large-scale bookkeeping and so on). But in physics we are typically dealing with a relatively small quantity of data that requires a large amount of processing, so most physicists really do not need the facilities provided by a large computer. There is a significant difference between the computational needs for running a bank or organizing a library and doing calculations in physics! With the microcomputer, the physicist pays only for what he needs: central processing time. Because of the enormous overhead (buildings, personnel and so on), computer centers charge typically \$500 per cpu hour; the cost of doing the same calculation on a microcomputer may be only a few cents! Furthermore, home computers are certainly going to be even more powerful in the near future. In this light, it is very likely that most calculations in physics will be performed by the home computer in the future.
- D To be specific, let me illustrate the considerations above with a concrete example. (The box on page 27 describes another.) In my own field, solid state physics, Monte Carlo simulations are among the most demanding types of calculations, requiring days or weeks of cpu time on large computers. Monte Carlo simulations are used typically to find phase diagrams and investigate critical properties near phase transitions. A standard model for studying phase transitions is the Ising model of a ferromagnet. In three dimensions, the model cannot be solved analytically, so one is left with a numerical approach. As I will show, even a "state-of-the-art" Monte Carlo simulation on the three-dimensional Ising model can be performed efficiently on a micro.
- E We consider the simple  $d$ -dimensional Ising model with spins  $\sigma_i = \pm 1$  arranged on a simple cubic lattice with linear dimension  $N$ . The energy of the various states of the model is given by the Hamiltonian

$$H = - \sum_{\langle i,j \rangle} \sigma_i \sigma_j$$

where the summation is over nearest neighbor pairs of spins. Clearly, the ground state at  $T = 0$  is one where all the spins are aligned,  $\sigma_i = +1$  (or  $-1$ ). For an infinite lattice there is a transition at a critical temperature  $T_c$  from a high-temperature disordered paramagnetic phase to the low-temperature ordered phase where the spins are partly aligned so that there is a net magnetization,  $M = \langle \sigma_i \rangle / N^d$ . The thermal expectation value  $\langle \sigma_i \rangle$  is defined as a weighted average over the Boltzmann factor

$$\langle \sigma_i \rangle = \frac{\sum_{\text{all states}} \sigma_i e^{-H/T}}{\sum_{\text{all states}} e^{-H/T}}$$

Because the summation is over  $2^{N^d}$  states each involving  $N^d$  spins, an exact calculation is not possible even for lattices of moderate size. In the Monte Carlo method, a representative sample of states is generated by a sampling technique that weighs states according to their importance. Successive states are generated by moving from site to site and flipping spins with probability

$$p = \begin{cases} e^{-\Delta E/T} & \text{for } \Delta E > 0 \\ 1 & \text{for } \Delta E < 0 \end{cases}$$

where  $\Delta E$  is the change in energy caused by the spin flip. Estimates of thermodynamic functions such as the order parameter  $M$  are obtained by averaging over the states obtained in this way.

Per Bak was a professor at the H. C. Ørsted Institute in Copenhagen, Denmark, and is now a scientist at BNL.

## Monte Carlo simulation

E We consider the simple  $d$ -dimensional Ising model with spins  $\sigma_i = \pm 1$

PHYSICS TODAY / DECEMBER 1983

**TÍTULO DO TEXTO: Doing Physics with Microcomputers.**

**Fonte: Physics Today. Dec.1983.**

**INSTRUÇÕES:** Não é permitido usar o dicionário.

Responda às questões em português.

Siga a ordem das perguntas. Responda na sequência apresentada e não volte atrás.

- I Leia reflita sobre o título e o subtítulo do texto. Depois assinale quantas alternativas você julgar possíveis.  
O texto a ser lido possivelmente incluirá os seguintes assuntos:
- ( ) o uso de computadores em física.
  - ( ) diferentes tipos de computadores.
  - ( ) pesquisas dentro da física com microcomputadores.
  - ( ) economia de gastos com pequenos computadores.
  - ( ) satisfação pessoal dos físicos.
  - ( ) cálculos feitos no computador.
- II Leia todo o texto sem se preocupar com as palavras desconhecidas. Repare que o texto está dividido em 5 parágrafos (A, B, C, D e E).  
Qual é o assunto global do texto? \_\_\_\_\_
- 
- III Leia os parágrafos A e B para responder às seguintes perguntas:
- A que tipo de computadores o autor se refere ao escrever "most micros..." (linha 6)? [1]
  - Quais as duas vantagens mencionadas pelo autor sobre os "micros" para os físicos? [2]
    - 
    -
- IV Leia o parágrafo C para responder às seguintes perguntas:
- Qual é a principal característica de um computador grande? [2]
  - Por que é possível para os físicos usarem um microcomputador? [2]
  - Além das vantagens de preço que o microcomputador oferece, qual é a outra vantagem futura que se pode prever para estes computadores? [1]
- V Leia o parágrafo D para responder à seguinte pergunta:  
Qual foi o motivo que levou o autor a exemplificar seu ponto de vista com os "Monte Carlo simulations"? [2]
- VI Leia o texto e traduza as palavras ou locuções, de acordo com o contexto em que elas ocorrem: [6]
- or so (linha 1)
  - near future (linha 12)
  - typical computer center (linha 16)
  - very demanding physics calculations (linha 27)
  - modern full-size computers (linha 29)
  - furthermore (linha 65)
- VII Leia o texto e verifique a que palavras ou expressões as palavras sublinhadas abaixo se referem: [4]
- they have not taken (linha 7)
  - will be but a fraction of that for (linha 14)
  - not much slower than those (linha 29)
  - so it is well suited (linha 43)

## Underdeveloped nations have special equipment needs

by Dietrich Rokahr

A

THE FIRST RULE to adopt when providing heavy construction equipment to underdeveloped countries is Murphy's Law: "If anything can go wrong, it will."

5 The second rule is "Do everything you possible can to minimize the chances of anything going wrong." These rules might sound extreme, but dealing with a severely under-developed nation requires special rules.

B

An underdeveloped country is one that has yet to develop its own infrastructure. It lacks the networks of roads, railroads, airports, shipping facilities,

DIETRICH ROKAHR represents Liebherr, Biberach an, Federal Republic of Germany.

15 and other support systems for moving goods and people that characterize developed nations. An underdeveloped country needs heavy construction equipment to build these systems, but 20 because that country doesn't have these systems—or the experience with machines to build them—equipment manufacturers face a whole range of special considerations when providing 25 the machines.

30 Transporting the machine to the job site can be a problem if sufficient roads, port facilities and handling equipment are not available, and spare parts and service back-up can pose additional problems. Other factors, such as changing political and economic conditions, may preclude importing parts and

35 service support once the machine is on the job.

D Support systems are vital because underdeveloped countries are largely inexperienced and unfamiliar with the use, operation and service of modern 40 heavy construction machines.

E A manufacturer can minimize potential problems and ensure the successful operation of his machine if he can fulfill two critical requirements.

45 First, the manufacturer should have previous experience with providing machines to similar countries for similar applications. Although there is no substitute for previous experience, the next 50 best thing would be for the manufacturer to visit the country and conduct a thorough investigation of all potential factors involved.

G Second, the manufacturer should be 55 willing to accept a great deal more pre-sale and after-sale responsibility than is usually called for in developed nations. He must be willing to advise and educate, as well as supply. The advisory role 60 begins with machine selection.

### General selection guidelines

H In an underdeveloped nation, availability and versatility are much more important than high production. Because they usually cannot afford to 65 purchase several types of machines for many kinds of work, contractors and governmental agencies in underdeveloped nations need versatile machines that are durable enough to last many 70 years. One excavator, for example, might be called upon to dig a ditch one day, and lift the pipes to go in the ditch the next.

I Availability is absolutely the number 75 one priority in an underdeveloped nation, and the manufacturer should assume several responsibilities to help ensure machine availability. The first three relate to the actual design of the 80 machine: quality workmanship, ease of service, and above all, simplicity of components. An underdeveloped country is not the place to test innovations or offer a lot of "extras." Also, the machine should not need highly specialized, high-replacement components that could be unavailable in underdeveloped nations.



VERSATILITY AND simple design are two keys for the heavy construction equipment used in developing nations. A small to medium excavator (up to 27,216 kg) equipped with a backhoe for digging and lifting can be sufficient.



TÍTULO DO TEXTO: **Underdeveloped nations have special equipment needs.**

Fonte: **World Construction.** vol.36(2) Feb.,1983.

INSTRUÇÕES: Não é permitido usar o dicionário.

Responda às questões em português.

Siga a ordem das perguntas. Responda na sequência apresentada e não volte atrás.

- I Leia e reflita sobre o título do texto. Depois, assinale quantas alternativas você julgar possíveis.  
O texto a ser lido possivelmente incluirá os seguintes assuntos:
- ( ) falta de condições para o bom funcionamento de maquinário.
  - ( ) equipamentos diferentes para o 3º Mundo.
  - ( ) pesquisas com equipamentos.
  - ( ) nações em desenvolvimento necessitam de equipamentos especiais.
  - ( ) problemas com equipamentos.
  - ( ) mal funcionamento de maquinários para países em desenvolvimento.
- II Leia todo o texto sem se preocupar com as palavras desconhecidas. Repare que o texto está dividido em 9 parágrafos (A, B, C, D, E, F, G, H e I). Qual é o assunto global do texto? \_\_\_\_\_
- 
- III Leia o parágrafo A e responda à seguinte pergunta:  
Quais são as duas regras de Murphy? [2]
- 1.
  - 2.
- IV Leia o parágrafo B para responder à seguinte pergunta:  
Por que os fabricantes de equipamentos enfrentam vários problemas quando fornecem peças para os países em desenvolvimento? [2]
- 1.
  - 2.
- V Leia o parágrafo C para completar os seguintes itens:  
Há vários problemas que podem surgir com relação ao transporte de máquinas e seu funcionamento. Cite um problema para cada item: [3]
- Problema de ordem pessoal =  
física =  
política =
- VI Leia os parágrafos E, F e G para responder às seguintes perguntas:  
a. Qual é o 1º requisito que o fabricante deve ter para diminuir problemas futuros? [2]  
b. Qual é o 2º requisito?
- VII Leia o parágrafo H para responder à seguinte pergunta:  
Por que a versatilidade e a durabilidade das máquinas é muito importante nos países em desenvolvimento? [1]
- VIII Leia o texto e traduza as palavras ou locuções, de acordo com o contexto em que elas ocorrem: [6]
- lacks (linha 13)
  - heavy construction equipment (linha 19)
  - face (linha 23)
  - preclude (linha 35)
  - the next best thing (linhas 49-50)
  - quality workmanship (linha 80=)
- IX Leia o texto e verifique a que palavras ou expressões as palavras sublinhadas abaixo se referem: [4]
- it will (linha 4)
  - It lacks (linha 13)
  - doesn't have those systems (linhas 20-21)
  - they usually cannot (linha 64)

## Selling medicines over the counter

A

The big drug companies of the western world and Japan are looking for new ways to make money. Some because their profits from prescription drugs are falling. Others because as their patents on prescription drugs expire they have nothing to put in their place. In seeking to preserve profits, they are switching to selling drugs, from vitamins to laxatives, which need no prescriptions.

B

Not everybody approves of this tactic. Doctors worry about patients being induced to buy unsuitable medicines by pharmacists—or even by advertising agencies. But the business pressures are inexorable. R&D costs for prescription drugs have soared. The stricter testing requirements that were introduced after deformed children were born to women who had taken thalidomide mean it can now cost up to \$100m to bring a new drug to market.

C

It is also harder and more expensive than it was to find the new winners to replace such profit-spinners as Hoffmann-La Roche's tranquilliser Valium, or SmithKline Beckman's anti-ulcer drug Tagamet (the world's top-selling drug last year, with sales of \$1 billion).

D

Cost-conscious customer governments, too, are squeezing the industry's profit margins. They resist price rises and are increasingly willing to permit the sale of cheap "copy-cat" versions of pills whose patents have now expired.

E

The "OTC" medicines—pills and potions sold "over the counter" of the pharmacy and the supermarket, with no need for a prescription—are much less of a hassle for the drug companies. They carry no heavy burden of safety testing costs. They can be advertised directly to the consumer instead of to busy and sceptical doctors.

F

These non-prescription drugs also fit the fad for self-help among the sick, or potentially sick. People in the rich countries fret more than they used to about well-being, fitness, and health. This, somewhat contradictorily, often makes them more likely to pop pills. European governments are promoting this trend to self-diagnosis and self-treatment. In attempting to reduce the taxpay-

ers' bill for healthcare, they are giving pharmacists authority freely to sell the sort of medicines that until recently could be obtained only on a doctor's prescription.

Non-prescription drugs are already a big business. In 1982, 10 American companies had sales of more than \$200m each from non-prescription drugs. The biggest was Bristol-Myers, with sales of \$620m. Together the 10 accounted for half of the \$6.7 billion drug sales made by some 300 companies in America.

Easy profits are not guaranteed, however, even to the big. Non-prescription drugs are not subject to rules and regulations on safety, price and advertising that are as severe as those for prescription drugs but they still cannot be marketed as freely as, say, chocolates or newspapers. And companies like American Home Products, Richardson, Vicks or West Germany's Bayer, which have dominated the non-prescription market for decades, will battle hard to retain, and if possible to increase, their market shares.

## Different counters

Measuring non-prescription drug sales worldwide is next to impossible. Drugs freely traded off shop shelves in one country are sold on prescriptions in another. For instance, antibiotics sold from vans touring the countryside in Nigeria are available only through doctors in most developed countries.

Marketing rules differ as well even in rich countries themselves. In America a drug that is given OTC status can be sold in any retail outlet, even petrol stations. But in western Europe most over-the-counter drugs are still sold only through pharmacists. As a result, two fifths of non-prescription medicines in America are sold by chemists, compared with four fifths or more in Britain, West Germany and Switzerland.

**TÍTULO DO TEXTO: Selling Medicines over the Counter.**Fonte: *The Economist*. May 5, 1984.**INTRUÇÕES:** Não é permitido usar o dicionário.

Responda às questões em português.

Siga a ordem das perguntas. Responda na sequência apresentada e não volte atrás.

- I Leia e reflita sobre o título do texto. Depois assinale quantas alternativas julgar possíveis:  
O texto a ser lido possivelmente incluirá os seguintes assuntos:
- ( ) falta de lucros que levam à venda de remédios.
  - ( ) pesquisa de mercado no ramo farmacêutico.
  - ( ) riscos à saúde com venda de medicamentos.
  - ( ) venda de medicamentos sem receita.
  - ( ) lucros obtidos com venda de remédios.
  - ( ) medidas adotadas contra venda livre de remédios.
- II Leia todo o texto sem se preocupar com as palavras desconhecidas. Repare que o texto está dividido em 10 parágrafos (A, B, C, D, E, F, G, H, I e J). Qual é o assunto global do texto? \_\_\_\_\_
- 
- III Leia o parágrafo A e responda à seguinte pergunta:  
O que leva grandes companhias de remédios a venderem medicamentos que não exigem receita médica? [2]
- 1.
  - 2.
- IV Leia o parágrafo B e responda à seguinte pergunta:  
Por que a venda livre de medicamentos tende a aumentar? [1]
- V Leia o parágrafo D para responder à seguinte pergunta:  
De que maneira as autoridades também ajudam no incentivo à venda de remédios sem prescrição médica? [2]
- 1.
  - 2.
- VI Leia o parágrafo E e responda à seguinte pergunta:  
Por que os medicamentos "OTC" são mais vantajosos para os fabricantes? [2]
- 1.
  - 2.
- VII Leia o parágrafo F e responda à seguinte pergunta:  
Que fatos contribuem para o livre consumo de medicamentos sem prescrição médica? [2]
- 1.
  - 2.
- VIII Leia o parágrafo H para responder à seguinte pergunta:  
Que itens estão incluídos nos regulamentos de controle de remédios? [1]
- 1.
  - 2.
  - 3.
- IX Leia o texto e traduza as palavras ou locuções, de acordo com o contexto em que elas ocorrem: [6]
- unsuitable medicines (linha 17)
  - testing requirements (linhas 22-23)
  - instead of (linha 54)
  - non-prescription drugs (linha 56)
  - as ... as ... (linha 89)
  - next to (linha 102)
- X Leia o texto e verifique a que palavras ou expressões as palavras sublinhadas abaixo se referem: [4]
- Others because (linha 6)
  - this tactic (linha 14)
  - They carry no (linha 51)
  - as those for prescription (linha 89)

## COLORATION OF POLYPROPYLENE FIBERS

By Marvin Wishman  
Phillips Fibers Corp.

A

5 - More than any other synthetic  
fiber, polypropylene owes its ex-  
istence to polymer additives which  
perform various tasks that the pure  
resin is unable to accomplish. As  
10 - prepared, the polymer is quite un-  
stable and at melt temperatures will  
decompose rapidly if thermal  
stabilizers are not added. The fibers  
will degrade in longer periods of time  
even at moderate temperatures if  
long-term stabilizers are not added.  
15 - Catalyst residues must be neutralized,  
frequently by the addition of calcium  
stearate to avoid other problems. If  
heat does not destroy the fiber, ex-  
posure to ultraviolet light will since  
the fibers react readily under certain  
conditions with atmospheric oxygen  
20 - to decompose in a chain reaction. In  
addition to antioxidants for thermal  
stabilization and a variety of types of  
UV stabilizers, certain synergists are  
used to help the additives do an even  
25 - better job than they can do by them-  
selves. In other words, polypropylene  
fiber products owe their existence to  
an assortment of stabilizers; all of  
which are expected to perform and  
30 - function without adding color to the  
resin.

B

35 - Although there have been several  
dyeable forms of polypropylene of-  
fered commercially, polypropylene  
fibers are usually not dyeable since  
the resin does not contain a dye site as  
do other commercially useful fibers.  
The cost of dyeing any fiber has in-  
creased rapidly in recent years  
40 - because of increasing raw material  
costs, energy costs, elimination of cer-  
tain products for health reasons,  
problems of disposal of waste liquor  
and other ecological factors. With the  
costs of dyeing increasing so rapidly,  
45 - even greater emphasis has been  
placed upon the use of pigmented  
fibers, particularly polypropylene.  
Polypropylene fibers are usually  
50 - colored by adding the pigments to the  
resin just prior to extrusion. Because

the pigments have had the reputation  
for long life, while the polypropylene  
fibers themselves have the reputation  
for short life, there was a time when - 55  
almost any pigment sufficiently ther-  
mally stable to be used at melt spinn-  
ing temperatures would have been ac-  
ceptable in terms of its color stability.  
Therefore, the fiber would have - 60  
degraded before it lost its color. Im-  
provements in stabilization have per-  
mitted polypropylene to enter many  
new markets. Pigmented fibers are  
used in floor coverings, indoors and - 65  
outdoors, on boats, in backyards, and  
on house decks. They are used in  
automobiles, where because of large  
expanses of glass, severe temperature  
problems cause other fibers to fail. - 70  
They are also used in upholstery  
fabrics in the home where stability re-  
quirements are not nearly as severe.  
Because of the broad spectrum of end  
uses, there is a need for a wide variety - 75  
of pigments exhibiting different cost  
as well as color stability charac-  
teristics, and this is what I would like  
to discuss in the coloration of  
polypropylene fibers.

TÍTULO DO TEXTO: **Coloration of Polypropylene Fibers.**

Fonte: **Fiber Prodducer**. Abril 1982.

INSTRUÇÕES: Não é permitido usar o dicionário.

Responda às questões em português.

Siga a ordem das perguntas. Responda na seqüência apresentada e não volte atrás.

- I Leia e reflita sobre o título do texto. Depois assinale quantas alternativas você julgar possíveis.  
O texto a ser lido possivelmente incluirá os seguintes assuntos:
- ( ) temperatura ideal para coloração.
  - ( ) o processo de coloração de fibras de polipropileno.
  - ( ) vários tipos de fibras.
  - ( ) o custo da coloração.
  - ( ) fibras pigmentadas.
  - ( ) a fibra de polipropileno no mercado.
- II Leia todo o texto sem se preocupar com as palavras desconhecidas. Repare que o texto está dividido em 2 parágrafos (A e B).  
Qual é o assunto global do texto? \_\_\_\_\_
- III Leia o parágrafo A novamente e responda às seguintes perguntas:  
Na última afirmação do parágrafo, o autor menciona: ... polypropylene fiber products owe their existence to **an assortment** of stabilizers ... Exemplifique esta afirmação de acordo com os exemplos dados no 1º parágrafo (assortment = sortimento). [3]
- 1.
  - 2.
  - 3.
- Quais as conseqüências do não uso de estabilizadores? [3]
- 1.
  - 2.
  - 3.
- IV Leia o parágrafo B para responder às seguintes perguntas: [4]
- a. O custo da coloração das fibras aumentou devido a:
    - 1.
    - 2.
    - 3.
    - 4.
  - b. Qual foi a importância da estabilização de cor para propipropileno?
  - c. Qual é a vantagem de usar fibras pigmentadas em automóveis?
  - d. Por que o autor se propõe discutir as características de diferenças de preços e estabilidade de cores?
- V Leia o texto e traduza as palavras ou locuções, de acordo com o contexto em que elas ocorrem: [6]
- a. owes (linha 2)
  - b. melt temperatures (linha 7)
  - c, avoid (linha 15)
  - d. chain reaction (linha 20)
  - e. dye site (linha 36)
  - f. just prior (linha 51)
- VI Leia o texto e verifique a que palavras ou expressões as palavras sublinhadas abaixo se referem: [4]
- a. exposure to ultraviolet **will** (linha 17)
  - b. even better job **they** can do
  - c. all of **which** (linhas 28-29)
  - d. while polypropylene fibers **themselves** (linha 54)

APPENDICES 14-15  
PRE-TEST AND POST-TEST - **BARTLETT-BOX F**

----- O N E W A Y -----

VARIABLE: PRE  
 BY VARIABLE GRUPO PRE-TESTE  
 GRUPO 0

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F-RATIO	F-PROB.
BETWEEN GROUPS	2	281.3930	140.6965	11.475	0.0000
WITHIN GROUPS	186	2280.6071	12.2613		
TOTAL	188	2562.0001			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95% CONF INT FOR MEAN	
GRP01	54	6.4074	3.4886	0.4747	0.0000	16.0000	5.4552	TO 7.3596
GRP02	75	5.0133	2.8734	0.3318	0.0000	16.0000	4.3522	TO 5.6744
GRP03	62	7.9167	4.1672	0.5380	0.0000	16.0000	6.8402	TO 8.9932
TOTAL	189	6.3333	3.6916	0.2685	0.0000	16.0000	5.8036	TO 6.8630
FIXED EFFECTS MODEL			3.5016	0.2547			5.8309	TO 6.8358
RANDOM EFFECTS MODEL				0.8744			2.5709	TO 10.0958

RANDOM EFFECTS MODEL - ESTIMATE OF BETWEEN COMPONENT VARIANCE 2.0589

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRAN'S C = MAX. VARIANCE/SUM(VARIANCES) = 0.4595, P = 0.019 (APPROX.)  
 BARTLETT-BOX F = 4.528, P = 0.011  
 MAXIMUM VARIANCE / MINIMUM VARIANCE = 2.103

----- O N E W A Y -----

VARIABLE: POS  
BY VARIABLE GRUPO POS-TESTE  
GRUP O

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F-RATIO	F-PROB.
BETWEEN GROUPS	2	93.2919	46.6460	3.602	0.0292
WITHIN GROUPS	186	2408.4648	12.9487		
TOTAL	188	2501.7567			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95% CONF INT FOR MEAN		
GRP01	54	10.5185	3.5060	0.4771	2.0000	18.0000	9.5616	TO	11.4755
GRP02	75	9.4000	3.3571	0.3876	4.0000	19.0000	8.6276	TO	10.1724
GRP03	60	11.0167	3.9552	0.5106	3.0000	18.0000	9.9949	TO	12.0384
TOTAL	189	10.2328	3.6479	0.2653	2.0000	19.0000	9.7094	TO	10.7562
FIXED EFFECTS MODEL			3.5984	0.2617			9.7164	TO	10.7492
RANDOM EFFECTS MODEL				0.5021			8.0724	TO	12.3932

RANDOM EFFECTS MODEL - ESTIMATE OF BETWEEN COMPONENT VARIANCE 0.5402

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRAN'S C = MAX. VARIANCE/SUM(VARIANCES) = 0.3990, P = 0.276 (APPROX.)  
BARTLETT-BOX F = 0.931, P = 0.394  
MAXIMUM VARIANCE / MINIMUM VARIANCE = 1.388